Northwest General Aviation

Airfield Pavement

Performance Equations

by
Stephen L. Alm

A report submitted in partial fulfillment
of the requirement for the degree of

Master of Science in Engineering

University of Washington
August 1996

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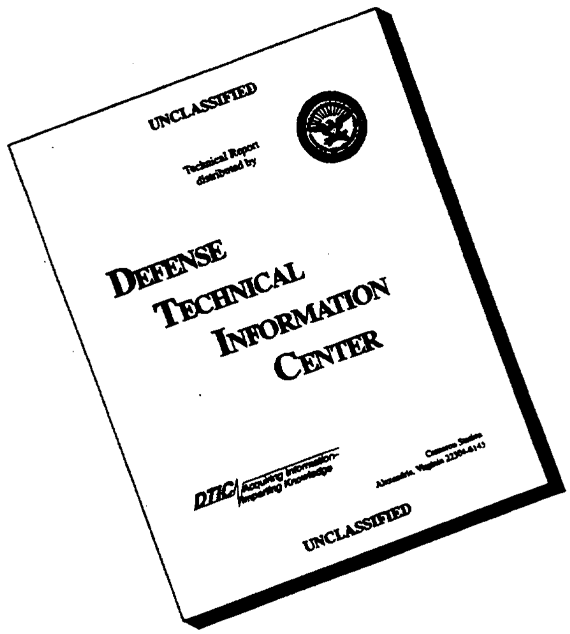

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1.0 Introduction

1.1 Introduction

Budgets for all forms of airfield construction, including maintenance and rehabilitation, continue to dwindle. With this decrease, the importance of managing existing pavement assets becomes increasingly significant. Airport managers often tend to delay pavement maintenance and rehabilitation without analyzing, or sometimes realizing, the effects of such decisions on future maintenance and rehabilitation costs. One of the most important steps to overcoming this potential problem is the emplacement of an effective pavement management system (PMS). A pavement management system is defined as "a set of tools or methods that can assist decision-makers in finding cost effective strategies for providing, evaluating and maintaining pavements in a serviceable condition."[3] A quality pavement management system provides critical information required for airport managers to properly analyze the structures under their purview. From this analysis, the airport manager can determine maintenance and rehabilitation requirements, project priorities, and can conduct more efficient long-term planning.

1.2 Prediction Modeling

Regularly scheduled pavement condition inspection is probably the most important aspect for implementing a comprehensive management program. These inspections involve "dividing the pavement network into logical segments, recording descriptive segment inventory data, and collecting pavement performance information relating to these segments."[7] From the data collected during these surveys, the progressive deterioration of the pavement can be reviewed. The major benefit is the use of this data to predict future pavement performance.

There are numerous tools used to predict pavement performance. Of these tools, the most widely used are mathematical models derived using regression analysis. The purpose of this paper is to utilize regression analysis to create mathematical models that will predict pavement life for the majority of general aviation airports in the Pacific Northwest. These models will provide an additional tool which may be used by airport managers to improve their information base and enhance their decision making methods.

As mentioned briefly above, a pavement management system allows the airport manager to make informed decisions on the most cost effective method of airfield maintenance. The use of performance modeling opens numerous areas that may contribute to an effective maintenance program. These areas include, but are not limited to:

- pavement life estimates,
- relative measures of rehabilitation effectiveness,
- life-cycle costing,
- general design decisions,
- planning decisions, and
- budget programming.

With the added knowledge obtained from this data, the airport manager can more easily face the challenges of working with limited capital. Maintenance and rehabilitation timing, pavement type, repair type, and overall design will be influenced by the pavement models.

Little research has been done in the area of regression modeling when dealing with general aviation airfield pavements. The issue was not a high priority for airport managers and little data existed. Over the last decade, however, the Federal Aviation Administration (FAA) began conducting pavement surveys utilizing the Pavement Condition Index (PCI) rating system. This collection of data has allowed the initiation of a database. Over time, if faithfully maintained and updated, this database will provide a wealth of information for use in increasingly better regression modeling.

1.3 Past Research

Two people have made an effort to develop comprehensive regression models based upon PCI data collected from the majority of general aviation airports in the Pacific Northwest. The first of these was LT Kim Weisenberger, Civil Engineer Corps, United States Navy, who began the initial statistical evaluation in 1988 utilizing the first sets of PCI data.[10] Unfortunately, most of the runways possessed data from only one survey. This meant that the regression models developed were not highly correlated and could not benefit airport managers to a great extent. It was, however, a significant first step in the development of an extensive database of PCI data for the general aviation airports in the Pacific Northwest. It also served to provide a strong foundation for future regression modeling work as the database expanded.

The second person to conduct research in this area was LT Christopher Floro, Civil Engineer Corps, United States Navy, who did so in 1992.[4] He took the results from Weisenberger's study a step further by adding an additional set of data points to the database. The goal was to utilize the same modeling techniques as in the previous study to confirm the validity of the methodology and regression equations developed. In this study, the data was not as comprehensive as in the first study. Several of the airports included in the original study did not have second surveys completed and were therefore omitted from the computations. The results of this study closely mimicked the original. Two data points per airport still did not provide regression models with accurate pavement performance predictions. Still further data would need to be collected. Once again, though, this study continued to expand and enhance the available database. The modeling foundation and methodology were further strengthened and the gate opened for the accomplishment of additional work.

1.4 Purpose

As mentioned above, it is the intention of this paper to assess runway deterioration rates. Only airfields common to the previous two studies will be reviewed in an effort to maintain data integrity. Similar procedures will be followed, only the regression analysis will be more in-depth. This paper's objectives are similar to Floro's[4]:

> 1) Provide pavement performance models (equations) and corresponding graphic representations that assist airport managers with their pavement management systems,
>
> 2) Demonstrate that properly utilized PCI data can help keep pavement rehabilitation and maintenance costs to a minimum, and
>
> 3) Provide a consolidated report containing pertinent and current data for use of the FAA and airport managers.

The above objectives will be addressed in the following chapters. Chapter Two will discuss research methodology and cover PCI survey techniques. Chapter Three consists of a thorough data review, analysis of the various pavement categories, and a summation of the report data from Weisenberger and Floro. Chapter Four contains the analysis of data applicable to this paper, equation development and pavement life calculations. A report summary, including summary and recommendations is included in Chapter Five.

2.0 Methodology

2.1 Introduction

As stated in Chapter One, this report will strive to develop regression models that will accurately represent the various pavements used in general aviation airfields. These models will provide a much needed enhancement to existing pavement management systems. The numerical and graphical outputs provided by these models will significantly improve the airport manager's ability to make sound maintenance, rehabilitation, design and life cycle costing decisions.

This study will try to establish correlations between various types of pavements used in airfield construction. Only flexible pavements and their repair/rehabilitation techniques will be evaluated. These include asphalt concrete pavements, asphalt concrete overlays, bituminous surface treatments, slurry seals and chip seals. PCC pavements will not be incorporated into this study.

The two major areas under consideration in this study are pavement LIFE and PCI versus AGE determinations. Pavement LIFE will be measured from the original construction date until the first maintenance treatment. This will help give a better idea of the durability and expected life cycle of a pavement. The PCI versus AGE data will lead to the pavement performance models. These determinations will also allow for a cursory overview of the performance of surface treatments and how they impact pavement life.

2.2 FAA, Advisory Circular 150/5380 - 6

In December 1982, the Federal Aviation Administration established Advisory Circular (AC) 150/5380-6, *Guidelines and Procedures for Maintenance of Airport Pavements*.[2] This publication accomplished two items of importance:

1) It outlined that a pavement management system was vital to maintaining airfield pavements in a cost effective manner, and

2) It outlined detailed procedures required for performing a Pavement Condition Index survey.

It is the latter of these items that directly concerns the development of regression models for pavement performance.

2.3 Pavement Condition Index Overview

The Pavement Condition Index rating system was developed by the U.S. Army Corps of Engineers to assess current pavement conditions.[10] The data obtained from this rating system provides interested parties with a wealth of information vital to an effective pavement management system. Three specific objectives for the condition survey are:[2]

1) To determine present condition of the pavement in terms of apparent structural integrity and operational surface condition.

2) To provide the FAA with a common index for comparing the condition and performance of pavements at all airports and also provide a rational basis for justification of pavement rehabilitation projects.

3) To provide feedback on pavement performance for validation and improvement of current pavement design, evaluation, and maintenance procedures.

By accomplishing these objectives, the rating system establishes a strong foundation upon which a pavement management system can be built.

The Pavement Condition Index rating survey is limited in its application, but effectively covers most areas in the airfield pavement realm. Only flexible pavements (those with conventional bituminous concrete surfaces) and jointed rigid pavements (jointed non-reinforced concrete pavements with joint spacing not exceeding 25 feet) fall into the survey categories. The survey consists mainly of a visual inspection of pavement surfaces for signs of distress. This distress may be caused by numerous factors, including: surface weathering, fatigue effects, poor drainage, differential settlement, or movement in the subbase over a time period. The survey assigns an index number ranging between 0 and 100 to the pavement structure. This number provides a reasonably objective and repeatable indication of the pavement condition.

Even though the PCI survey is fairly simple to conduct, it is often very time consuming, disruptive to airport operations and may be quite expensive. Although these factors may appear detrimental, the FAA has continued conducting rating surveys. With data in hand and the proper tools (performance models) available, airport managers will be able to better evaluate the progressive deterioration of pavements and have better insight into actual pavement life expectancies.

Appendix A provides a general overview of the procedures involved in actually conducting a PCI survey. The complete procedure is taken from Appendix A of FAA Advisory Circular 150/5380-6.[2]

2.4 Pavement Distress Related to PCI

The heart of the PCI rating system is the identification of pavement distress and its severity. These external signs or indicators indicate the deterioration of a pavement and can be associated with the probable causes of the failures or imperfections in the pavement system. There are several causal factors that relate to specific types of pavement distress. Pavement type, be it rigid or flexible, tends to influence the type of observed distress. Although each pavement type demonstrates its own characteristics, the distress manifestations will generally fall into one of the following broad categories[2]:

a) Cracking -- In PCC pavements cracks often result from stresses caused by contraction or warping of the pavement. Poor joint design and/or construction, overloading, and loss of subgrade support may also contribute to PCC cracking. Flexible pavement cracking is caused by deflection of the surface over an unstable foundation. Shrinkage of the surface, reflection cracking, and poorly constructed lane joints may also contribute.

b) Distortion -- Distortion occurs when the pavement surface changes from its original position. Foundation settlement, expansive soils, frost susceptibility, and poor subsurface drainage systems lead to distortion in PCC pavements. In asphalt pavements, distortion is caused by swelling soils or frost action in the subgrade, foundation settlement, poor bond between the surface and the underlying layer of the pavement structure, or lack of stability in the asphalt mix.

c) Disintegration -- The breaking up of a pavement into small, loose particles is referred to as disintegration. Improper curing and finishing, unsuitable aggregates, and improper mixing of the concrete cause disintegration in PCC pavements. Insufficient surface compaction, too little asphalt in the mix, or overheating of the mix will lead to disintegration of flexible pavements.

d) Skid Resistance -- The ability of a pavement to provide good friction characteristics under all weather conditions is a function of the pavement's surface texture or the build-up of contaminants. Polished aggregates and surface contaminants are the primary reasons for poor friction performance in PCC pavements. Too much asphalt, whether in the mix or from the prime coat, poor aggregate subject to wear, and the build-up of contaminants are the factors decreasing skid resistance in flexible pavements.

During the course of a rating survey, each feature of the pavement system is reviewed for signs of any of the aforementioned distress traits. Based upon the severity of the distress, each sample of the feature is assigned a "deduct value." These "deduct values" are totaled, adjusted, and subtracted from 100 to obtain the recorded PCI value.

2.5 Regression Analysis

There has been much mention of regression analysis to this point. What exactly is it though? When a relationship needs to be established between two or more variables, regression is the statistical tool that is used. In other words, regression analysis is used to generate an equation that will predict one variable from one or more other variables.[8] There are normally two variable types, dependent and independent. The variable being predicted (commonly "y") is referred to as the dependent variable while the variable used to predict (commonly "x") is the independent variable. This relationship between variables is rarely perfect. Therefore, an equation that minimizes the differences between the regression curve and the actual data is desirable. Usually a "least squares fit" method is utilized to provide the "best fit." Due to this variation, there are several parameters used to judge how well an equation "fits" the actual data. These parameters are[6]:

a) Coefficient of determination (R^2) -- This value explains how much of the total variation in the data is explained by the regression equation.

b) Root mean square error (RMSE) -- This is the standard deviation of the distribution of the predicted value "y" value for a specific value of "x".

c) Number of data points (N) -- Under most circumstances, the more data points used in developing the equation, the better the equation will be.

d) Hypothesis tests on regression constants (generally based on the t-statistic).

There are several different levels of regression modeling. The simplest of these is linear regression, with one independent variable. A simple linear model is very limited in its application however, so other forms will also be used in an effort to discover the most accurate model possible. These other methods include a power fit, exponential fit, WSDOT power fit, and logarithmic fit. Chapter Four will discuss the various equations in more detail and provide equation formats.

2.6 Modeling

There are four basic criteria that are important when developing reliable pavement models. The following are the specific criteria[1]:

a) an adequate database built from in-service pavements,

b) the inclusion of all variables that significantly affect pavement performance,

c) an adequate functional form of the model, and

d) a model that meets the proper statistical criteria for precision and accuracy (error of prediction, coefficient of determination (R^2), etc.)

The goal of modeling is to replicate past performance of a particular element based on variable input data.[10] The inputs to these models can range from the simple to the highly complex. This paper deals only with the more simple inputs. The PCI values utilized take into account the pavement's overall condition. Incorporated into these values are many of the extraneous factors that ideally should be separated out. These factors include climate, construction method, materials, traffic frequency, loading, time of construction, etc. The superficial inclusion of these items into the PCI value is the best available method until it is determined that a better database be developed. Until that time, the models developed during this research study are considered the most applicable based on the constraints. All of the aforementioned modeling criteria are met with the exception of "the inclusion of all variables that significantly affect pavement performance."

2.7 PCI vs. AGE Curves

As stated previously, the goal of this paper is to produce performance curves that best represent the anticipated performance of a specific pavement type. For purposes of this study, pavements with similar characteristics will be grouped together for analysis. Several different curve varieties will be applied to provide equations that will produce the information needed to successfully predict pavement performance.

The best way to understand this objective is to review an example curve demonstrating pavement performance. Figure 2.1 demonstrates a typical PCI vs. AGE curve common to many pavement types.

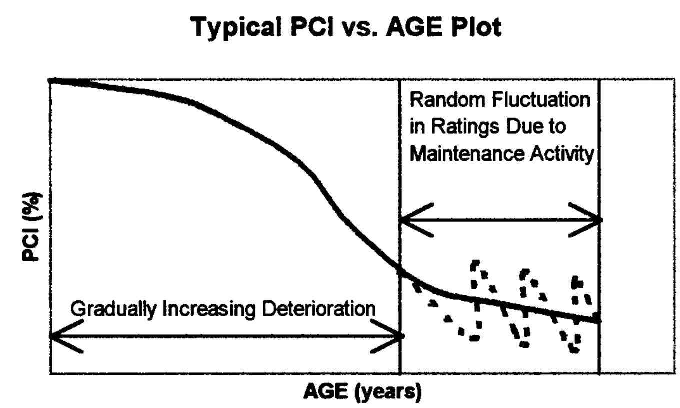

Figure 2.1 Typical PCI vs. AGE Plot[6]

From this figure, one is able to notice the gradual increase in deterioration of the pavement with age. This graph approaches an ideal representation of pavement behavior. As different regression models are used, each produces a unique curve. Figure 2.2 demonstrates some of the different curve possibilities.

Although all of the curves plotted in Figure 2.2 are variations on the Power Fit, they nonetheless serve to demonstrate how different equations will generate different curves. One can see that the PCI rating of the pavement decreases with age in each case, but the rate of decrease is dramatically altered depending upon the curve applied. Chapter Four will contain several plots using a variety of regression forms in an effort to find the best data fit.

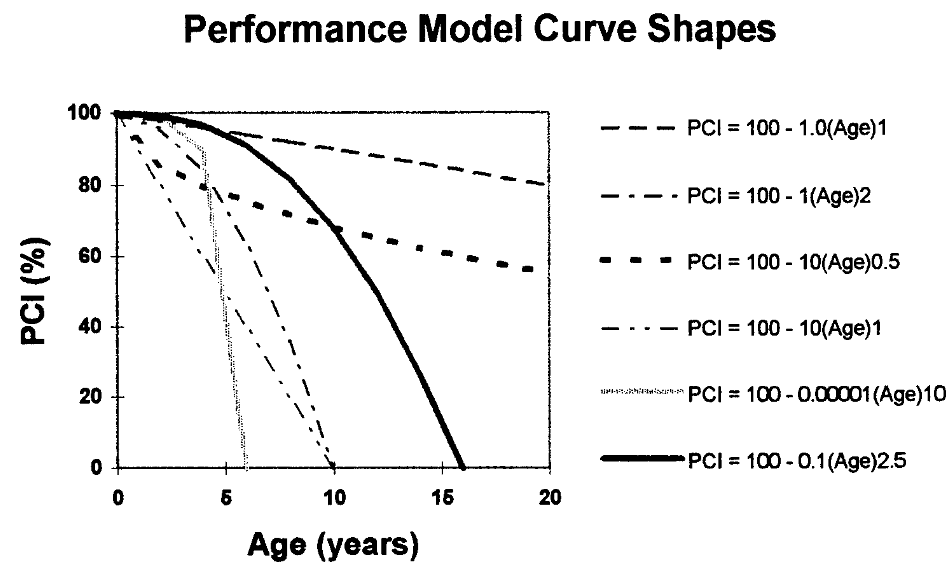

Figure 2.2 Performance Model Curve Shapes[6]

This paper's second objective is to examine the correlation between pavement structure and its estimated life. The LIFE of a pavement is defined as the length of time between original pavement construction and its first corrective or maintenance application. It is also the difference in time between maintenance applications. The LIFE measurements confirm the validity of the regression models by allowing comparison of the regression model results to the simple LIFE calculations.

Figure 2.3 depicts a typical straight line performance plot of a pavement with a constant asphalt thickness and varying base thickness. The plot demonstrates the effect of an increased base thickness on pavement life. This model could be used in several ways, but mainly it graphically illustrates various pavement life cycles. This information could be used to help determine the most cost effective solution.

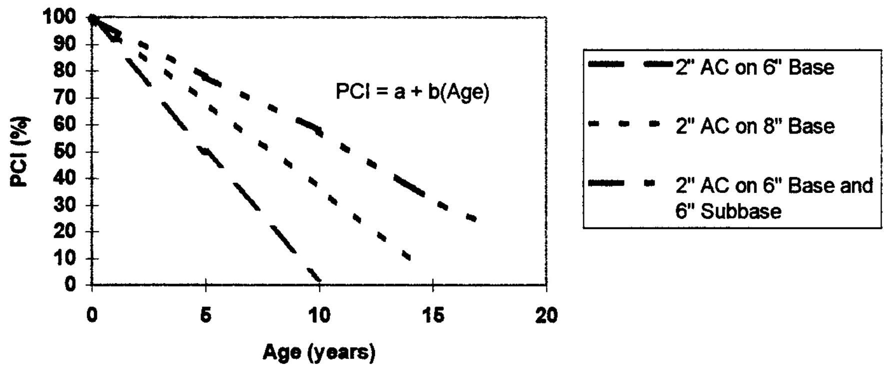

Figure 2.3 Example of PCI vs. AGE for flexible pavement with constant AC and vary base composition.[10]

2.8 The Pavement Condition Index Rating Scale

Figure 2.4 is a pictorial representation of the breakdown of the PCI rating scale. The left side depicts a numerical value achieved from the survey results. The right side of the diagram depicts a corresponding verbal rating.

The diagram indicates that pavement failure occurs when the PCI rating reaches 10%. The pavement is considered very poor between 10% and 25%. It is recommended, however, that pavements be rehabilitated or replaced when the PCI value reaches 55%.

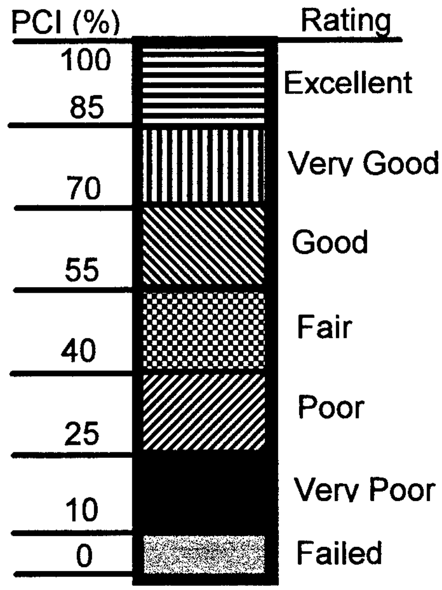

Figure 2.4 Airport Pavement Condition Index (PCI)
Rating Scale

It is important to point out the relationship between pavement condition index and pavement condition rating (PCR). PCR is typically used in highway performance rating. The Washington State Department of Transportation (WSDOT) replaced it in 1992 with the pavement structural condition, but PCR remains a valuable measurement of overall pavement condition.[6] The PCR system is similar to the PCI system. The outcome of a PCR survey is a numerical percentage. This percent does not correlate with the PCI percentages. The important point of note is that a pavement is considered at the end of its service life with a PCR value of 40. This value closely relates to the PCI value of 55%.

3.0 Data Review and Analysis

3.1 Introduction

The completion of this paper required a large amount of varied data. This chapter will discuss the source of this data, how it was categorized and why these categories were chosen. A review of Weisenberger's[10] 1988 results, Floro's[4] 1992 results, and current Federal Aviation Administration data is included for comparison purposes and as an outline of the process followed. Several tables listing the category of each airport are included in this chapter. They serve to illustrate the breakdown of the numerous runways incorporated into this study.

3.2 Data Source

A significant amount of data had to be reviewed and analyzed during the course of this study. Pavement Condition Index surveys from the majority of general aviation airports in Washington, Oregon and Idaho were reviewed for a variety of data inputs. Unfortunately, there has been a steady decline in the amount of data actually usable for the continuation of this modeling exercise. Table 3.1 demonstrates the decline of usable data from Weisenberger's[10] 1988 study to this 1996 study.

Table 3.1 Decline of data evaluated between studies

Study Year	*Airports Evaluated*	*Runways Evaluated*
1988	142	240
1992	120	202
1996	101	146

Although PCI surveys are conducted on all features (taxiways, aprons, runways, etc.) of an airport, only runways were considered for the purposes of this study. Runways tend to be the controlling pavement at any airfield. The higher speeds of operation, increased loading use, and higher stresses encountered tend to deteriorate runways faster than any other pavement feature.

The majority of data gathered for this study came from PCI surveys conducted over the last decade on general aviation runways in the Pacific Northwest. Appendixes B, C, and D contain actual Pavement Condition Index rating surveys from Washington, Oregon, and Idaho respectively. These surveys demonstrate the methodology used in each state and how that procedure varies. Idaho is the most unique in that it used the *MICROPAVER* computerized pavement management system in its last series of surveys. This system presents PCI data in a much different manner than the manual survey write-ups utilized by Washington and Oregon. Nonetheless, each survey contains a wide variety of pertinent information to include:

a) original construction date
b) maintenance history
c) airport layout
d) sample locations and areas
e) types of pavement distress
f) maintenance recommendations
g) climate data
h) trend conditions
i) feature summaries

Much of the information obtained from these surveys was hard to interpolate. Many of the runways were constructed as far back as 1942, with little or no information contained in the maintenance history until the 1960's at the earliest. Even after pavement histories were being maintained, much of the included information was very sketchy. The terminology used is inconsistent, large gaps appear to exist in timing, and PCI results given do not correspond with normal pavement behavior. These factors were all taken into account when establishing the data categories.

As previously mentioned, PCI ratings are dependent upon various types of distress observed within the pavement structure being surveyed. Ideally, a modeling algorithm will attempt to correlate the PCI rating values to each type of distress found in the pavement. The significant data constraints in this project did not allow this technique to be feasible. Therefore, the PCI values used in this report deal only with the overall pavement rating.

The PCI rating survey, though useful, is by no means a definitive method of measuring pavement condition. A PCI survey is conducted manually by a pavement engineer. Each surveyor is trained by the same FAA office in an effort to ensure consistency and repeatability. The survey, however, still can be very subjective. For this reason, some of the PCI data points do not seem to follow normal pavement behavior. In fact, in a few surveys, the PCI rating increased over a three to four year time span even though no maintenance was documented on the pavement. This could be due to poor maintenance record keeping, but is most likely due to surveyor inconsistencies. All data collected is submitted to the FAA for review and approval. All data reviewed in this study have been blessed as acceptable by the FAA. With these factors taken into account, the data were accepted at face value and utilized as found. Runways that had data points increasing or contained unknowns were omitted from inclusion in the data base.

3.3 Review of 1988 and 1992 Data

Weisenberger[10] conducted the initial study developing regression models in 1988. His results were taken a step further by Floro[4] in 1992. There are numerous similarities in the difficulties encountered during the course of this study. Pavement histories are sketchy, data is inconsistent, and terminology is varied. Several assumptions were made in an effort to lend credibility to the data base.

To try and make comparison between these three studies easier, the pavements have been categorized in a similar manner. Unfortunately, the number of data points usable in the study has continually declined. The first study utilized one data point from each runway. PCI surveys were only available from 1986 and all runways involved had at least one survey done. The second study focused on utilizing two data points from each runway. Several of the airports did not have second surveys completed and several of the surveys were discounted due to inconsistent data results. Therefore, there were fewer runways available for the analysis. This paper's original focus was to examine runways with three data points. Once again, far fewer runways were available. In fact, the reduction appeared to possibly hinder further study. Taking this into consideration, it was determined that runways with two and three data points could be combined for purposes of the regression analysis. This would increase the available data as several of the airports discounted from the second study had since had new surveys completed, thereby adding a wider array of data.

The major difference in data categorization between the first two studies was in the area of BST pavements and surface maintenance applications. There were not enough data points to warrant a breakdown between single, double, and triple bituminous surface treatments and only slurry seal maintenance techniques were reviewed. In this study, categorization is identical to the second survey with all BST pavements combined. However, two forms of maintenance techniques were reviewed; slurry seals and chip seals.

Both of the previous studies generated regression equations using selected data from the PCI surveys available. The performance models developed were limited in their application due to the limited number of data points available, but provided a good approximation of pavement and maintenance treatment behavior. The models developed in both studies were not intended to be used as strict guidelines in assessing an individual pavement, but as a tool in evaluating various alternatives. A complete comparison will be conducted in Chapter Four.

3.4 Data Interpretation for 1996 Study

As occurred in the previous studies, some elementary assumptions were made at the outset of this study. A PCI rating value of 100% was assumed to occur at AGE zero. AGE was established as zero either at new construction or when a maintenance treatment other than a fog seal or crack seal was introduced. This assumption is fairly plausible, but may not be consistently valid. If the construction technique was improper or subpar materials were used, the pavement may not originally have possessed a perfect PCI value. Even with these factors taken into account, the basic assumption is fairly credible.

Another assumption was that pavements received a surface treatment when the PCI value approached 55%. This assumption was based upon the FAA recommendation that pavements receive some sort of rehabilitation when the PCI rating approaches "Satisfactory." Once again, this assumption may not be true at all times, but it serves to establish a solid baseline upon which to base pavement life. For the purposes of this study, pavement LIFE is defined as the time between construction or surface application and the subsequent maintenance or rehabilitation procedure.

One can see how the assumption of rehabilitation at a PCI of 55% applies to LIFE determinations by reviewing the following example reviewing Condon State Airport. Originally constructed in 1966 with a one inch blade mix asphalt top course, the pavement surface lasted until a seal coat was applied in 1975 (9 year LIFE). This surface lasted until the runways were reconstructed in 1986 with five inches of concrete (11 year LIFE). A PCI survey in 1987 gave the pavement a 94% rating and a survey in 1991 gave the pavement a 78% rating. Table 3.2

summarizes some of the conclusions that can be drawn from this information and demonstrates the technique that will be applied for LIFE calculations. PCI loss per year was determined using the repair at PCI equal to 55% assumption. In other words, if the repair occurred at 55%, then 45% had been utilized in the LIFE of the pavement. This 45% was divided by the life of the pavement:

$$\textit{PCI Loss per Year \#1} = \frac{45\%}{9\ years} = 5\%\ \textit{Loss per year}$$

For the present pavement, the PCI loss per year was determined by dividing the decrease in PCI by the age of the pavement:

$$\textit{PCI Loss per Year \#1} = \frac{6\%}{1\ year} = 6\%\ \textit{Loss per year}$$

Table 3.2 LIFE and AGE calculation example

Pavement Type	*LIFE*	*Age @ PCI #1*	*Age @ PCI #2*	*PCI Loss per Year #1*	*PCI Loss per Year #2*
1-inch Blade Mix	9	n/a	n/a	5%	n/a
Seal Coat	11	n/a	n/a	4.1%	n/a
PCC	n/a	1	5	6%	4.4%

Table 3.2 also serves to demonstrate how pavement deterioration rates will vary not only between pavement type, but also as a pavement ages. These rates, as mentioned previously, could be due to numerous factors.

3.5 Pavement Comparisons

As mentioned briefly above, this study originally was going to review pavements possessing three sets of PCI ratings. Due to the limited number of usable data points available however, airfields containing two sets of PCI ratings were also included. The individual points from these surveys would be grouped into categories of common pavement characteristics. Within each of these categories, an attempt would be made to develop an appropriate regression model.

These plans were problematic in execution though. As in the previous studies, the data had to be filtered and many of the points ruled out. Several pavements had surveys that reflected an increase in the PCI rating, with no maintenance recorded. This may have happened between the first and second survey or the second and third survey. Regardless, these points were omitted from the study. Numerous airfields received a surface treatment between surveys. As already mentioned, the application of a surface treatment serves to reset the time clock and PCI scale. These runways were therefore omitted from the study as well. The final data sets excused were those where the PCI value remained the same between surveys. Once again, this may have occurred between the first and second or second and third surveys.

3.6 Data Review

Five different pavement categories were used in the analysis of the PCI data. Each of these categories was determined based upon similar pavement characteristics. In other words, pavement structures that could be expected to exhibit similar behaviors were grouped into distinct categories. These categories are asphalt concrete pavement, asphalt concrete overlays, bituminous surface treatments, surface maintenance techniques (slurry seals and chip seals), and portland cement concrete. Portland cement concrete pavements were not reviewed due to their limited number of data points and widely varied deterioration rates. Flexible pavements were broken into four further categories.

The following tables list the data categories and the PCI information within each category. Within each table, AGE refers to the time separation between the

PCI survey and the preceding surface treatment, whether new construction or maintenance treatment. LIFE numbers refer to the pavement's life span between surface treatments. Only airports that contain at least two valid data points are included in the tables. A summary of all airport data is included in Appendix E.

3.6.1 Asphalt Concrete Pavements

When the term flexible pavement is utilized, one is usually referring to a pavement constructed using bituminous (or asphalt) materials in the surface (or wearing) course. These pavements may consist of bituminous surface treatments or asphalt concrete (AC) surfaces. They are called flexible due to the pavement's ability to bend or deflect under traffic loading. Generally, flexible pavements are composed of several layers of materials that can accommodate this flexing.[11] Most AC pavement designs incorporate a wearing course of asphalt concrete, a base course of high quality aggregate, and possibly a subbase course of a lower quality aggregate. The base and subbase courses may be composed of a variety of aggregate types; crushed or uncrushed, treated or untreated, or any combination thereof. For the purposes of this study, only the asphalt concrete pavements fall into this category. Bituminous surface treatments are analyzed in another category.

Within the asphalt concrete pavement category, four subdivisions have been created for this study. These categories facilitate grouping the pavements into areas with similar performance characteristics.

1) 2 - 3 inches AC on 6 - 8 inches of base -- This category contains pavements that possess a wearing course between two and three inches and a granular base thickness less than eight inches. The base thickness could be a combination of base and subbase material, as long as it was less than eight inches in depth. Table 3.3 contains a listing of the airport runways that fall into this category.

2) 2 - 3 inches AC on 8+ inches of base -- This category contains pavements that possess a wearing course between two and three inches and a granular base thickness greater than eight inches. The base thickness could be a combination of base and subbase material, as long as it totaled more than eight inches in depth. Table 3.4 contains a listing of the airport runways that fall into this category.

3) Greater than 3 inches AC on any base -- This category contains all pavements with a wearing course greater than three inches on any depth of granular base. It was determined that a pavement surface of at least three inches will limit the impact of base and subbase thickness on performance. Contrary to the previous two studies, no airports meeting the aforementioned criteria fell into this category. No further review was conducted.

4) World War Two pavement -- A large number of the airports surveyed were constructed during World War Two (between 1942 and 1945). Although a large amount of data is available on these airfields, most of it only covers the last two decades. There is an extensive gap in pavement history. The data suggest that many of these runways went over thirty-five years with no maintenance of any type. This appears to be an impossibility due to the fairly high PCI values recorded during the first surveys. In fact, several of the PCI surveys comment on the fact that "it is very apparent from looking at the existing pavement condition that some sort of surface treatment had been applied, however, there are no records within the files to confirm it."[10] Due to this aberration in the data, pavements with a baseline date between 1942 and 1945 are being addressed as an individual group. This will prevent the other pavement categories from being biased. Table 3.5 contains a listing of the airport runways that fall into this category.

Table 3.3 2-3 inches of Asphalt on Less than 8 inches of Base

Airport Name	R/W ID	State	PCI #1	Age #1	PCI #2	Age #2	PCI #3	Age #3
Elma Municipal Airport	R1	WA	88	12	83	15	n/a	n/a
Evergreen Field, Vancouver	R1	WA	55	20	51	24	n/a	n/a
Evergreen Field, Vancouver	R2	WA	86	16	77	20	n/a	n/a
Lake Chelan Airport	R1	WA	93	2	90	7	n/a	n/a
Moses Lake Municipal Airport	R2	WA	29	14	18	18	n/a	n/a
Port of Ilwaco Airport	R1	WA	71	15	49	18	36	21
Bend Municipal Airport	R2	OR	89	2	79	5	n/a	n/a
Brookings State Airport	R1	OR	90	18	88	21	n/a	n/a
Gold Beach Municipal Airport	R1	OR	90	22	88	25	n/a	n/a
Pacific City/State Airport	R1	OR	79	37	75	41	n/a	n/a
Prineville Airport	R1	OR	87	7	83	10	n/a	n/a
Prineville Airport	R2	OR	86	7	85	10	n/a	n/a
Seaside State Airport	R1	OR	88	23	83	27	n/a	n/a
Bear Lake County Airport	R2	ID	96	2	57	9	n/a	n/a

Table 3.4 2-3 inches of Asphalt on More than 8 inches of Base

Airport Name	R/W ID	State	PCI #1	Age #1	PCI #2	Age #2	PCI #3	Age #3
Auburn Municipal Airport	R1	WA	81	19	84	23	n/a	n/a
Auburn Municipal Airport	R2	WA	90	4	87	8	n/a	n/a
Harvey Field (Snohomish)	R1	WA	64	16	64	16	n/a	n/a
Pierce County (Puyallup)	R1	WA	n/a	n/a	98	1	91	4
Port of Willipa Harbor Airport	R2	WA	68	15	59	18	46	21
Baker Municipal Airport	R4	OR	88	3	82	6	n/a	n/a
Bend Municipal Airport	R1	OR	80	9	79	12	n/a	n/a
Hood River Airport	R1	OR	96	1	92	5	n/a	n/a
Hood River Airport	R2	OR	95	1	90	5	n/a	n/a
John Day State Airport	R3	OR	93	4	92	7	n/a	n/a
La Grande Municipal Airport	R3	OR	88	2	78	5	n/a	n/a
McDermitt State Airport	R1	OR	96	1	76	4	n/a	n/a
Ontario Municipal Airport	R1	OR	84	9	70	12	n/a	n/a

Table 3.5 Airports constructed during World War II

Airport Name	R/W ID	State	Baseline Year	PCI #1	Age #1	PCI #2	Age #2	PCI #3	Age #3
Bowers Field, Ellensburg	R3	WA	1942	57	44	64	47	53	51
Bowers Field, Ellensburg	R4	WA	1942	54	44	52	47	49	51
Bremerton National	R3	WA	1942	86	45	80	49	n/a	n/a
Bremerton National	R5	WA	1942	82	45	80	49	n/a	n/a
Deer Park Airport	R3	WA	1943	47	43	39	46	n/a	n/a
Kennewick-Vista Field	R2	WA	1942	68	45	63	50	n/a	n/a
Olympia Airport	R1	WA	1942	55	46	45	49	n/a	n/a
Winlock (Toledo) Airport	R1	WA	1943	49	43	42	46	36	49
Baker Municipal Airport	R3	OR	1942	69	44	66	47	n/a	n/a
Bear Lake County Airport	R1	ID	1942	27	44	2	51	n/a	n/a

3.6.2 AC Overlays

An asphalt concrete overlay is one of the primary means of rehabilitating a pavement.[4] It serves to provide added structural integrity, improved surface characteristics and enhanced overall safety. There are several forms of overlays ranging from Portland Cement Concrete over concrete to asphalt concrete over PCC to asphalt over asphalt.[5] An asphalt concrete overlay can vary in thickness from less than an inch to several inches. The most common depth observed in this data review was a two inch overlay. This category deals solely with asphalt concrete (or flexible) overlays. Base type was not considered when categorizing these pavements. All overlays were grouped into this category regardless of thickness or base composition. Table 3.6 contains a listing of the airport runways that fall into this category.

3.6.3 Bituminous Surface Treatments

As mentioned previously, bituminous surface treatments fall into the flexible pavement category. They are inherently different from asphalt concrete pavements however, and have been separated out for purposes of this study.

A BST pavement basically provides a weatherproof wearing course, but adds very little structural capability to the pavement. BST's are most often used in areas with limited traffic. Normally less than one inch in thickness, they are often applied on top of a well compacted aggregate base. They may also be utilized as a maintenance application, applied over an existing asphalt or BST pavement. The separation between maintenance application and new construction led to problems in Weisenberger's study due to the terminology used in the rating surveys. For purposes of this study, pavements that had a "chip seal" applied or a "BST" applied as a maintenance treatment were evaluated separately from new construction BST's.

Within the new construction realm, there are several different categories of BST application; single, double, or triple bituminous layer treatment (BST, DBST, or TBST respectively). These categories refer not to the number of consecutive layers, but rather to layers containing gradually increasing aggregate size. In other words, a TBST contains three layers of treatment with each successive layer containing a larger aggregate size. Within this study, all BST pavements were regarded together, regardless of the number of layers. Table 3.7 contains a listing of the airport runways that fall into this category.

Table 3.6 Runways with Overlays

Airport Name	R/W ID	State	Overlay Depth	PCI #1	Age #1	PCI #2	Age #2	PCI #3	Age #3
Bremerton National	R1	WA	3	86	13	86	17	n/a	n/a
Bremerton National	R2	WA	5	83	13	75	17	n/a	n/a
Bremerton National	R4	WA	2	88	13	83	17	n/a	n/a
Connell City Airport	R1	WA	2	69	8	79	12	n/a	n/a
Crest Airport, Kent	R1	WA	2	97	1	90	5	n/a	n/a
Moses Lake Municipal Airport	R1	WA	2	89	3	81	7	n/a	n/a
Oak Harbor Air Park	R1	WA	2	73	17	68	21	n/a	n/a
Ocean Shores Airport	R1	WA	1	n/a	n/a	95	2	93	5
Olympia Airport	R3	WA	3	86	8	84	11	n/a	n/a
Omak Airport	R1	WA	2.5	68	12	65	15	61	18
Packwood Airport	R1	WA	2	94	3	90	6	n/a	n/a
Richland Airport	R1	WA	2	86	8	81	13	n/a	n/a
Richland Airport	R2	WA	2	94	8	82	13	n/a	n/a
Wilbur Airport	R1	WA	2	92	1	83	4	75	8
Ashland Municipal Airport	R1	OR	2	91	1	89	5	n/a	n/a
Aurora State Airport	R1	OR	2	85	8	81	11	n/a	n/a
Illinois Valley Airport	R1	OR	2	87	10	83	14	n/a	n/a
La Grande Municipal Airport	R2	OR	4	72	12	68	15	n/a	n/a
Lake County Airport	R1	OR	1.75	71	12	68	16	n/a	n/a
Pinehurst State Airport	R1	OR	1	83	2	76	6	n/a	n/a
Port of Astoria Airport	R1	OR	0.75	87	7	79	11	n/a	n/a
Port of Astoria Airport	R1A	OR	0.75	77	7	68	11	n/a	n/a
Sunriver Airport	R1	OR	2	92	1	79	4	n/a	n/a
Tillamook Airport	R1	OR	1.5	92	4	89	8	n/a	n/a
Kellogg (Shoshone Co.) Airport	R1	ID	1	94	6	62	15	n/a	n/a
Kellogg (Shoshone Co.) Airport	R2	ID	1	94	6	60	15	n/a	n/a
Kellogg (Shoshone Co.) Airport	R4	ID	3	96	6	82	15	n/a	n/a
Kellogg (Shoshone Co.) Airport	R5	ID	3	93	6	80	15	n/a	n/a

Table 3.7 Runways Constructed with BST

Airport Name	R/W ID	State	Structure	PCI #1	Age #1	PCI #2	Age #2	PCI #3	Age #3
Colville Municipal Airport	R1	WA	TBST	62	2	52	6	n/a	n/a
Concrete Municipal Airport	R1	WA	DBST	61	12	34	15	24	18
Ione Municipal Airport	R1	WA	TBST	76	13	76	16	70	19
Odessa Municipal	R1	WA	DBST	79	2	46	6	n/a	n/a
Odessa Municipal	R2	WA	TBST	58	2	50	6	n/a	n/a
Sequim Valley Airport	R1	WA	DBST	52	3	42	6	n/a	n/a
Storm Field (Morton)	R1	WA	TBST	73	1	68	4	n/a	n/a
Woodland State Airport	R1	WA	TBST	91	3	88	7	n/a	n/a
Christmas Valley Airport	R1	OR	BST	90	2	86	6	n/a	n/a
NewHalam Bay State Airport	R1	OR	TBST	80	8	77	12	n/a	n/a
Prineville Airport	R3	OR	BST	39	7	31	10	n/a	n/a

3.6.4 Surface Maintenance Applications and Techniques

The area of surface maintenance applications appears to have the widest variation in treatment when comparing the previous studies. Weisenberger[10] separated maintenance treatments into three categories for review. Floro[4] reviewed only slurry seals as it was the only maintenance procedure with two or more data points. This study will review slurry seals and chip seals.

As with BST's, surface maintenance techniques serve to provide a weatherproof wearing course rather than a structural component. Surface maintenance techniques come in a wide variety of methods with an equal variation in costs. The simplest method is crack sealing, in which an asphalt emulsion is placed over pavement cracks in an effort to prevent further damage from occurring. Crack sealing is typically applied to only those portions of the pavement that require it. Therefore, it has little impact on the results of a PCI rating survey. The next method involves the application of an asphalt emulsion onto the pavement surface. Commonly called a fog seal or emulsion application, they do little to affect the pavement's structure and therefore have a limited effect on PCI ratings. The next maintenance method is referred to as a slurry, or sand, seal. This technique uses a well-graded fine aggregate (or sand), mineral filler, emulsified asphalt, and water which is squeegeed onto the pavement's surface. Slurry seals were a very popular maintenance method as viewed in the survey data. The final maintenance method is the chip seal, seal coat, or BST. These applications are all similar in nature and differ only in their application timing. All involve an asphalt application which is followed by an aggregate cover. As previously mentioned, new construction BST's were disassociated from maintenance BST's and evaluated separately.

Both slurry seals and chip seals were utilized to a significant extent on many of the pavements analyzed. Each of these maintenance methods served to "reset" the PCI clock to 100% and the AGE clock to zero. Table 3.8 contains the slurry sealed pavements and Table 3.9 the chip sealed pavements.

Since neither of these techniques provide any structural support to the pavement, the underlying structure most reflects the possible performance of the maintenance application. However, all slurry seals and all chip seals were reviewed as groups. A separate listing of complete pavement type is found in Appendix E.

Table 3.8 Slurry sealed pavements

Airport Name	R/W ID	State	PCI #1	Age #1	PCI #2	Age #2	PCI #3	Age #3
Bowers Field, Ellensburg	R1	WA	n/a	n/a	64	2	62	6
Ephrata Municipal Airport	R1A	WA	60	17	55	21	n/a	n/a
Ephrata Municipal Airport	R2	WA	53	17	43	21	n/a	n/a
Lind Airport	R1	WA	51	5	51	9	n/a	n/a
Pru Field (Ritzville)	R1	WA	83	2	77	6	n/a	n/a
Quincy Municipal Airport	R1	WA	72	7	70	11	n/a	n/a
Rosalia Municipal Airport	R1	WA	68	2	49	6	n/a	n/a
Sand Canyon (Cehwelah) Airport	R1	WA	88	1	70	4	62	8
Sanderson Field (Shelton)	R1	WA	77	9	72	12	n/a	n/a
Waterville Airport	R1	WA	65	1	57	5	n/a	n/a
Whitman County Memorial Airport (Colfax)	R1	WA	57	5	40	8	29	12
Willard-Tekoa Field	R1	WA	n/a	n/a	90	2	85	6
Roseburg Municipal Airport	R1	OR	77	1	57	5	n/a	n/a
Scappoose Industrial Airport	R1	OR	65	1	64	5	n/a	n/a
Kellogg (Shoshone Co.) Airport	R3	ID	40	3	22	12	n/a	n/a
Nampa Municipal Airport	R1	ID	91	1	48	9	n/a	n/a
Orofino Municipal Airport	R1	ID	81	6	59	15	n/a	n/a
Priest River Municipal Airport	R1	ID	86	6	27	15	n/a	n/a

Table 3.9 Chip sealed pavements

Airport Name	R/W ID	State	PCI #1	Age #1	PCI #2	Age #2	PCI #3	Age #3
Kennewick-Vista Field	R1	WA	69	11	66	16	n/a	n/a
Mansfield Airport	R1	WA	35	5	27	10	n/a	n/a
Sekiu Airport	R1	WA	68	1	61	5	n/a	n/a
Sekiu Airport	R2	WA	88	1	85	5	n/a	n/a
Sunnyside Airport	R1	WA	85	2	80	7	n/a	n/a
Bandon State Airport	R1	OR	72	14	57	17	n/a	n/a
Burns Municipal Airport	R2	OR	49	8	39	11	n/a	n/a
Craigmont Municipal Airport	R1	ID	57	11	56	20	n/a	n/a

3.7 Portland Cement Concrete

As already mentioned, Portland Cement Concrete pavements will not be evaluated during the course of this study due to the lack of applicable data involved. This is contrary to the previous two studies, but applicable due to the lack of data integrity.

3.8 Pavement Life Data

Pavement LIFE was an important aspect evaluated during the course of this study. Unlike the PCI versus AGE comparisons, the categories for evaluating LIFE were slightly different with nine different categories being evaluated. These categories were identical to those used in the Floro[4] study in an effort to allow comparisons to be made. The following tables list the categories and the airports within each category. Included in each table is the original construction date, type of repair, date of repair, and life span of either the original pavement or repair type, depending upon the category.

Once again, the time frames of original construction and maintenance application were reviewed. As in the PCI versus AGE categorization, all airports constructed during the World War Two (1942 - 1945) time frame were separated out from those constructed after. This lessens the possibility of utilizing runway data that may not include a number of early repairs. Table 3.10 contains pavements constructed during World War Two that have less than three inches of asphalt. Table 3.11 contains pavements constructed during World War Two that have three or more inches of asphalt.

Table 3.10 WWII Pavements, Less than 3 inches Asphalt

Airport Name	State	Original Type	Original Construction	Repair	Date Repair	Life
Bowerman Field, Hoquiam	WA	Asphalt	1943	Overlay	1990	47
Bremerton National	WA	Asphalt	1942	Overlay	1974	32
Ephrata Municipal Airport	WA	Asphalt	1943	Slurry seal	1970	27
Kennewick-Vista Field	WA	Asphalt	1942	Chip seal	1976	34
Olympia Airport	WA	Asphalt	1942	Overlay	1980	38
Richland Airport	WA	Asphalt	1943	Overlay	1979	36
Richland Airport	WA	Asphalt	1943	Overlay	1979	36
Sanderson Field (Shelton)	WA	Asphalt	1942	Slurry seal	1979	37
William R. Fairchild Int'l Airport	WA	Asphalt	1942	Overlay/slurry seal	1979	37
William R. Fairchild Int'l Airport	WA	Asphalt	1942	Overlay/slurry seal	1979	37
William R. Fairchild Int'l Airport	WA	Asphalt	1942	Overlay/slurry seal	1978	36
Baker Municipal Airport	OR	Asphalt	1942	Seal coat	1963	21
Baker Municipal Airport	OR	Asphalt	1942	Seal coat	1963	21
Boardman Airport	OR	Asphalt	1943	Overlay	1980	37
Burns Municipal Airport	OR	Asphalt	1942	Reconstructed	1987	45
Burns Municipal Airport	OR	Asphalt	1942	Chip seal	1978	36
Corvallis Municipal Airport	OR	Asphalt	1942	Overlay	1984	42
La Grande Municipal Airport	OR	Asphalt	1942	Overlay	1974	32
Lake County Airport	OR	Asphalt	1943	Overlay	1985	42
Madras City/County Airport	OR	Asphalt	1943	Overlay	1977	34
McMinnville Municipal Airport	OR	Asphalt	1943	Slurry seal	1980	37
North Bend Municipal Airport	OR	Asphalt	1943	Overlay	1977	34
North Bend Municipal Airport	OR	Asphalt	1943	Overlay	1977	34
Pendleton Municipal Airport	OR	Asphalt	1942	Overlay	1974	32
Pendleton Municipal Airport	OR	Asphalt	1942	Overlay	1978	36
Pendleton Municipal Airport	OR	Asphalt	1942	Overlay	1978	36
Pendleton Municipal Airport	OR	Asphalt	1942	Overlay	1978	36
Pendleton Municipal Airport	OR	Asphalt	1942	Chip seal	n/a	n/a
Port of Astoria Airport	OR	Asphalt	1944	Overlay	1980	36
Scappoose Industrial Airport	OR	Asphalt	1943	Slurry seal	1986	43
Newport Municipal Airport	OR	Asphalt	1944	Overlay	1984	40
Newport Municipal Airport	OR	Asphalt	1944	Slurry seal	1984	40
The Dalles Municipal Airport	OR	Asphalt	1943	Slurry seal	1965	22
Tillamook Airport	OR	Asphalt	1943	Overlay	1983	40
Tillamook Airport	OR	Asphalt	1943	Chip seal	1983	40

Table 3.11 WWII Pavements, 3 inches or More Asphalt

Airport Name	State	Original Type	Original Construction	Repair	Date Repair	Life
Arlington Municipal Airport	WA	Asphalt	1942	Overlay	1976	34
Bremerton National	WA	Asphalt	1942	Overlay	1974	32
Bremerton National	WA	Asphalt	1942	Overlay	1974	32
Ephrata Municipal Airport	WA	Asphalt	1943	Slurry seal	1970	27
Omak Airport	WA	Asphalt	1943	Overlay	1974	31
North Bend Municipal Airport	OR	Asphalt	1943	Overlay	1977	34
North Bend Municipal Airport	OR	Asphalt	1943	Chip seal	1952	9
Pendleton Municipal Airport	OR	Asphalt	1942	Overlay	1974	32

All pavements constructed after World War Two have been grouped into similar categories to the World War Two pavements. Table 3.12 contains airports with less than three inches of asphalt and Table 3.13 contains airports with three inches of asphalt or more.

Table 3.12 Post WWII, Less than 3 inches Asphalt

Airport Name	State	Original Type	Original Construction	Repair	Date Repair	Life
Blaine Municipal Airport	WA	Asphalt	1972	Overlay	1992	20
Harvey Field (Snohomish)	WA	Asphalt	1970	Seal coat	1982	12
Pangborn Field (Wenatchee)	WA	Asphalt	1947	Chip seal	1974	27
Pearson Airpark (Vancouver)	WA	Asphalt	1966	Chip seal	1975	9
Pearson Airpark (Vancouver)	WA	Asphalt	1966	Chip seal	1975	9
Pierce County (Puyallup)	WA	Asphalt	1958	Reconstructed	1988	30
Prosser Airport	WA	Asphalt	1977	Reconstructed	1977	0
Pullman-Moscow Regional Airport	WA	Asphalt	1948	Overlay	1972	24
Sekiu Airport	WA	Asphalt	1972	Chip seal	1987	15
Sekiu Airport	WA	Asphalt	1979	Chip seal	1987	8
Willard-Tekoa Field	WA	Asphalt	1975	Slurry seal	1987	12
Godendale Airport	WA	Asphalt	1984	Slurry seal	1992	8
Oroville Airport	WA	Asphalt	1986	Chip seal	1992	6
Albany Municipal Airport	OR	Asphalt	1959	Overlay	1986	27
Baker Municipal Airport	OR	Asphalt	1983	Reconstructed	1983	0
Bandon State Airport	OR	Asphalt	1966	Chip seal	1972	6
Chiloquin State Airport	OR	Asphalt	1961	Seal coat	1968	7
Florence Municipal Airport	OR	Asphalt	1968	Reconstructed	1985	17
Hermiston Municipal Airport	OR	Asphalt	1959	Overlay	1977	18
Ontario Municipal Airport	OR	Asphalt	1977	Reconstructed	1977	0
Roseburg Municipal Airport	OR	Asphalt	1951	Slurry seal	1986	35
Tri-city State Airport	OR	Asphalt	1970	Chip seal	n/a	n/a
Arco (Butte County) Airport	ID	Asphalt	1979	Reconstructed	1990	11
Bear Lake County Airport	ID	Asphalt	1984	Fog seal	n/a	n/a
Buhl Municipal Airport	ID	Asphalt	1983	Slurry seal	1992	9
Caldwell Airport	ID	Asphalt	1975	Slurry seal	1986	11
Caldwell Airport	ID	Asphalt	1975	Slurry seal	1986	11
Craigmont Municipal Airport	ID	Asphalt	1975	Fog seal	1987	12
Driggs Municipal Airport	ID	Asphalt	1975	Overlay	1991	16

Table 3.12 (con't)

Airport Name	State	Original Type	Original Construction	Repair	Date Repair	Life
Gooding Municipal Airport	ID	Asphalt	1978	Slurry seal	1985	7
Jerome County Airport	ID	Asphalt	1981	Slurry seal	1987	6
Mountain Home Municipal Airport	ID	Asphalt	1973	Overlay	1993	20
Nampa Municipal Airport	ID	Asphalt	1976	Fog seal	1982	6
Orofino Municipal Airport	ID	Asphalt	1969	Slurry seal	1980	11
Priest River Municipal Airport	ID	Asphalt	1975	Slurry seal	1980	5
Rexburg (Madison County) Airport	ID	Asphalt	1972	Reconstructed	1991	19
Rexburg (Madison County) Airport	ID	Asphalt	1977	Reconstructed	1991	14
Rexburg (Madison County) Airport	ID	Asphalt	1977	Slurry seal	n/a	n/a
St. Maries Municipal Airport	ID	Asphalt	1978	Overlaid	1987	9
Soda Springs Airport	ID	Asphalt	1969	Slurry seal	1983	14

Table 3.13 Post WWII, 3 inches or More Asphalt

Airport Name	State	Original Type	Original Construction	Repair	Date Repair	Life
Bowers Field, Ellensburg	WA	Asphalt	1976	Slurry seal	1987	11
Pangborn Field (Wenatchee)	WA	Asphalt	1947	Chip seal	1974	27
Pullman-Moscow Regional Airport	WA	Asphalt	1968	Reconstructed	1993	25
Pullman-Moscow Regional Airport	WA	Asphalt	1968	Reconstructed	1993	25
Sunnyside Airport	WA	Asphalt	1975	Chip seal	1985	10
Aurora State Airport	OR	Asphalt	1975	Overlay	1978	3
Roberts Field/Redmond Airport	OR	Asphalt	1975	PFC	1981	6
Grangeville (Idaho Co.) Airport	ID	Asphalt	1965	Overlay	1983	18
Grangeville (Idaho Co.) Airport	ID	Asphalt	1983	Slurry seal	1988	5
Grangeville (Idaho Co.) Airport	ID	Asphalt	1983	Slurry seal	1988	5
McCall Municipal Airport	ID	Asphalt	1974	Slurry seal	1985	11

All pavement overlays were grouped into the same category, regardless of thickness or type of subpavement. A lack of sufficient data prevented further breakdown. Table 3.14 contains a listing of pavements within the overlay category.

Table 3.14 Overlay Pavements

Airport Name	State	Original Type	Original Construction	Repair	Date Repair	Follow-on Repair	Life
Anacortes Airport	WA	DBST	1968	Overlay	1973	1991	18
Anacortes Airport	WA	DBST	1968	Overlay	1973	1991	18
Anacortes Airport	WA	DBST	1968	Overlay	1973	1991	18
Arlington Municipal Airport	WA	Asphalt	1942	Overlay	1976	1991	15
Pullman-Moscow Regional Airport	WA	Asphalt	1948	Overlay	1972	1993	21
Sand Canyon (Cehwelah) Airport	WA	Slurry Seal	1974	Overlay	1979	1985	6
Burley Municipal Airport	ID	Asphalt	n/a	Overlay	1980	1992	12
Challis Airport	ID	BST	1973	Overlay	1986	1991	5
Grangeville (Idaho Co.) Airport	ID	Asphalt	1965	Overlay	1983	1988	5

As in the previous studies, all bituminous surface treatments were grouped together for evaluation. Table 3.15 contains a listing of the pavements that were evaluated in this category.

Table 3.15 Bituminous Surface Treatment Pavements

Airport Name	State	Original Type	Original Construction	Repair	Date Repair	Life
Anacortes Airport	WA	DBST	1968	Overlay	1973	5
Anacortes Airport	WA	DBST	1968	Overlay	1973	5
Anacortes Airport	WA	DBST	1968	Overlay	1973	5
Cashmere-Dryden Airport	WA	TBST	1951	Seal coat	1976	25
Colville Municipal Airport	WA	DBST	1949	Seal coat	1958	9
Connell City Airport	WA	BST	1970	Overlay	1979	9
Crest Airport, Kent	WA	BST	1967	Overlay	1986	19
Davenport Airport	WA	BST	1973	BST	1977	4
Ferry County (Republic) Airport	WA	BST	1974	Chip seal	1978	4
Grand Couly Dam Airport	WA	BST	1972	Overlay	1980	8
Ione Municipal Airport	WA	BST	1973	UNK	n/a	n/a
Lind Airport	WA	DBST	1971	Slurry seal	1982	11
Mansfield Airport	WA	BST	1973	Chip seal	1979	6
Moses Lake Municipal Airport	WA	DBST	1961	Slurry seal	n/a	n/a
Ocean Shores Airport	WA	DBST	1985	Overlay	1987	2
Odessa Municipal	WA	DBST	1970	Reconstructed	1985	15
Odessa Municipal	WA	DBST	1970	Reconstructed	1985	15
Okanagan Legion Airport	WA	BST	1955	DBST	1987	32
Packwood Airport	WA	BST	1975	Overlay	1985	10
Port of Willipa Harbor Airport	WA	BST	1948	Reconstructed	1971	23
Port of Willipa Harbor Airport	WA	BST	1948	Reconstructed	1971	23
Pru Field (Ritzville)	WA	TBST	1978	Slurry seal	1985	7
Quincy Municipal Airport	WA	BST	1977	Slurry seal	1980	3
Storm Field (Morton)	WA	BST	1970	TBST	1987	17
Waterville Airport	WA	BST	1976	Slurry seal	1988	12
Whitman County Memorial Airport (Colfax)	WA	BST	1970	Slurry seal	1981	11
Wilbur Airport	WA	BST	1971	Seal coat	1983	12
Ashland Municipal Airport	OR	BST	1965	Overlay	1986	21
Illinois Valley Airport	OR	BST	1953	Overlay	1977	24
NewHalam Bay State Airport	OR	BST	1965	TBST	1979	14
Pinehurst State Airport	OR	BST	1956	Overlay	1985	29
Prospect State Airport	OR	BST	1962	DBST	1986	24
Sunriver Airport	OR	DBST	1970	Seal coat	1973	3
Challis Airport	ID	BST	1973	Overlay	1986	13
Sandpoint Airport	ID	BST	1952	Reconstructed	1988	36

Table 3.16 contains slurry sealed pavements that have undergone further maintenance applications. Although a large number of slurry sealed airports were evaluated in the PCI versus AGE portion, very few had any further maintenance

done. Only those pavements that had been further repaired were included in the study.

Table 3.16 Slurry Sealed Pavements

Airport Name	State	Original Type	Original Construction	Repair	Date Repair	Follow-on Repair	Life
Caldwell Airport	ID	Asphalt	1975	Slurry seal	1986	1987	1
Caldwell Airport	ID	Asphalt	1975	Slurry seal	1986	1987	1
Gooding Municipal Airport	ID	Asphalt	1978	Slurry seal	1985	1989	4
Jerome County Airport	ID	Asphalt	1981	Slurry seal	1987	1991	4
McCall Municipal Airport	ID	Asphalt	1974	Slurry seal	1985	1990	5
Soda Springs Airport	ID	Asphalt	1969	Slurry seal	1983	1992	9

Pavements that had chip seals or were seal coated were also reviewed, but too few data points existed for a statistically deterministic evaluation to be properly accomplished.

4.0 Analysis and Results

4.1 Analysis Introduction

The performance equations contained in this chapter are the essence of this study. They were calculated using the *SPSS* statistical software package. The primary reference item in the development of these regression equations was *Statistical Methods for WSDOT Pavement and Material Applications*.[8] It provided the framework and guidelines required for pavement modeling. Also providing extensive help was *Development and Implementation of Washington State's Pavement Management System*.[9] This report outlined the WSDOT pavement management system and provided a thorough overview of the regression specifics required.

It is important to stress that the models contained in this report should serve to provide only a guideline for predicting pavement performance. These models are additional tools that give the airport manager or planner more information on the options available within the budgetary constraints that are most likely applicable. The limitations on the data utilized in this study restrict the use of these models in any other manner.

4.2 Regression Analysis Expanded

Chapter Two provided a brief introduction to the topic of regression analysis and its utilization in this study. Two regression models were applied to the data in this study, simple linear and simple non-linear. The term "simple" is used to reflect that only one independent variable exists within the equations. The two variables being examined within this study are AGE and PCI. PCI is the dependent variable and AGE is the independent variable.

To differentiate between linear and non-linear equations, the equations must be examined. A linear equation utilizes no power functions. In other words, both the parameters (b_o and b_1) and the independent variable (AGE) are not power functions. A non-linear, or curvilinear equation is one in which the parameters appear as exponents or are multiplied or divided by other parameters. In some non-linear models, the independent variable(s) are second order powers (or higher).[8]

The simplest form of regression model is a linear equation. The basic regression model for a linear analysis is:

$$y_i = b_0 + b_1 x_i$$

where: y_i = predicted value of "y" at the i^{th} data point,
x_i = independent variable at the i^{th} data point, and
b_0, b_1 = regression constant (b_0 = intercept and b_1 = slope).

In this equation 'y' represents PCI and 'x' represents AGE. This equation plots as a straight line when graphically displayed.

There are three forms of curvilinear regression models that will be utilized in this study. The first of these is the power fit. This equation takes the following form:

$$PCI = b_0 \, (AGE)^{b_1}$$

A log transformation is required to obtain the regression constants. Upon transformation the equation is represented as:

$$\log PCI = \log b_0 + b_1 \log (AGE)$$

Another form of the power model is utilized by the WSDOT pavement management system. This formula 'fixes' the power. Different numbers, usually between 1.0 and 3.0 varied by 0.25, are inserted into the power cell until the best fit is obtained. This equation takes on the following form:

$$PCI = b_0 - b_1(AGE)^{Power}$$

The next regression model utilized is the exponential fit. This equation takes the following form:

$$PCI = b_0 e^{b_1(AGE)}$$

As in the Weisenberger[10] study, a logarithmic model was also examined during the course of this research. The logarithmic model used for analysis takes the following form:

$$PCI = b_0 + b_1 ln(AGE)$$

For this study, no modeling was done using polynomial models. This is contrary to Floro's[4] study, which utilized them extensively. The addition of more than one independent variable degrades the statistical integrity of the outcome.

Chapter Two hinted at some of the factors that indicate the reliability or confidence associated with an equation formed from regression analysis. The following list will expand on the main factors and list several new ones.

a) Coefficient of Determination (R^2) -- Explains how much of the total variation in the data is explained by the regression equation. Expressed as a percent, this value indicates the relation of the data points to the equation line. If all data points fall directly on the line, the R^2 value is 100%. If the points have little relation to the line, the R^2

value is much lower. Therefore, the higher this value, the better approximation the line is to the data points.[8]

b) T-Ratio -- This value is the result of a hypothesis test. It determines how well the independent variable predicts the dependent variable. Normally, the T-Ratio should be greater than 2.0 for each independent variable to be a relatively strong predictor of the dependent variable.[4]

c) Standard Error of the Estimate (SEE) -- Utilized to estimate the standard deviation of the dependent variable about the regression line, the SEE value is in units of the dependent variable. The smaller the SEE value, the better reliability of the equation.[4]

4.3 Regression Assumptions

As mentioned in Chapter Three, one of the main assumptions in this paper was that at new construction or after the application of a surface treatment, the PCI/AGE clock 'reset' to a PCI value of 100% and a pavement AGE of zero. This assumption was applied to each set of data points and utilized in both group and individual pavement models. This assumption was applied to new construction, AC overlays, chip seals, slurry seals, and reconstruction.

4.4 Regression Equation Development

The assumption of a PCI value equal to 100% is fairly plausible, but may not be agreeable to all parties. It is reasonable to assume, however, that an airport manager would not accept a pavement containing obvious defects. There would be little control over concealed defects, which might impact the pavement's long term performance. Therefore, the equations developed took this fact into account. Where determined applicable, these initial points were not included and are so reflected in the equation tables.

During the initial study by Weisenberger[10], certain models had the PCI equal to 100% and AGE equal zero values removed. The equations developed were essentially the same, containing slight differences in the R^2, T-ratio, and PCI 'y' intercept. Floro[4] noted similar results, especially when reviewing surface maintenance techniques. The range of materials used and the impact of underlying pavement condition prevent the 'resetting' of the PCI/AGE clock from being an accurate assumption. For purposes of this study, however, all pavements were reviewed utilizing only the initial PCI equal to 100%. With little difference in the equations developed in the previous studies, no effort was made to duplicate the results.

The goal of this paper is to provide the best possible model that will provide an accurate prediction of pavement performance. The state of Washington has found the WSDOT power model to be the most reliable indicator of future pavement performance.[9] It was suspected that this model would provide the 'best fit' for airport pavements as well. This paper utilized all models mentioned in Section 4.2 in an effort to find the model best representing the data.

The *SPSS* program utilized for the statistical analysis provided all values based upon the data contained in Chapter Three. Linear, exponential, logarithmic, and straight power regression models were determined utilizing the curve estimation portion of the program. The WSDOT power models utilized the non-linear regression portion of the program. The curve estimation portion of *SPSS* provided the equation parameters, T-ratio, SEE values, and R^2 values. The non-linear component of SPSS provided the equation parameters, R^2 values, and the Root Mean Square Error(RMSE) values. Appendix F contains a summary table of the results from each modeling run.

In previous studies, two regression models were developed for each set of data. One model was developed utilizing all available data. A second model was developed with certain data points, that appeared to schew the model, omitted. For purposes of this study, regression modeling was done using only full data sets. No firm criteria could be developed for the legitimate removal of certain data points and therefore, a second data run was not justified. This assumption may be faulty in that certain data points would be allowed to alter the data, but given the limitations on the data possessed, no other option was warranted.

4.5 Regression Analysis and Results

Following are the results obtained from the regression analysis performed on the various data categories. Two, and possibly three, regression equations will be given for each category reviewed. A linear model and the 'best fit' WSDOT power model are shown for each analysis. A logarithmic or exponential model may be shown if it provided the best overall R^2 valued. The linear model was chosen due to its simplicity and the ease of making predictions based solely upon slope. The WSDOT model is shown due to the proposed correlation between airport and highway pavements.

The data obtained in this study was divided into categories as specified in Chapter Three. A brief restatement here will serve to provide a quick reference. A statistical analysis was conducted on runways by individual state and by combined data from each state. If data were insufficient for a valid analysis, no results were obtained.

Only flexible pavements were reviewed for this study. These were categorized based upon pavement construction date, pavement type, and pavement depth. Slurry seals and chip seals were the only maintenance techniques reviewed. The following is the category arrangement for the pavement sections:

- Flexible Pavements 4.5.1
- Asphalt Overlays 4.5.2
- Bituminous Surface Treatments 4.5.3
- Slurry Seal Maintenance 4.5.4
- Chip Seal Maintenance 4.5.5

4.5.1 Asphalt Concrete Surfaced Pavement Results

The asphalt concrete pavements were broken into four categories for analysis. One category was solely for pavements constructed during World War Two with no documented maintenance. The other three categories were based upon pavement thickness. No data was available for the pavement category of asphalt pavements with more than three inches of material. The equations obtained do not appear statistically significant although most demonstrate higher R^2 values than in the previous two studies, significantly higher than Floro's[4] study and varied with Weisenberger's[10] study.

For pavements with less than three inches of asphalt and less than eight inches of base, the logarithmic model presents the highest R^2 value. When graphically viewed, the logarithmic model does not represent typical pavement performance. Therefore, even though it possesses the highest statistical values, it should not be utilized in PCI prediction. This is true in all of the categories where the logarithmic model had the highest values.

The linear model proved the 'best fit' for pavements with less than three inches of asphalt and more than eight inches of base in all cases. In the World War Two pavement category, the linear and WSDOT power models produced nearly identical R^2 values.

4.5.1.1 Regression Models Obtained

Tables 4.1a through 4.3b contain the results of the regression analysis performed on the flexible pavement data. The 'a' tables list a comparison of linear equations from all three studies. The 'b' tables list a comparison of WSDOT power models where available and a third 'best fit' equation where applicable. Figures 4.1 through 4.3 contain graphical plots of the combined data analysis. Plots for individual states, when available, can be found in Appendix G.

Table 4.1a Linear regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on less than 8 inches of base material

Pavement Type	Location Category		1996 Linear Equations	1992 Linear Equations	1988 Linear Equations
Asphalt, 2 - 3 inches Less than 8 inches of base	All	Equation	PCI = 94.0 - 0.995(AGE)	PCI = 82.0- 0.486(AGE)	PCI = 98.8 - 1.12(AGE)
		R^2	28.2	5.3	68.8
		T-Ratio	4.06	1.13	12.18
		SEE	17.63	20.01	6.3
		# Airports	14	n/a	n/a
		N	29	25	68
	WA	Equation	PCI = 100.4 - 2.38(AGE)	PCI =99.1 - 2.14(AGE)	PCI = 99.1 - 1.59(AGE)
		R^2	60.7	34	83.9
		T-Ratio	5.13	2.78	11.46
		SEE	17.47	19.2	5.61
		# Airports	6	n/a	n/a
		N	13	17	23
	OR	Equation	PCI = 95.6 - 0.461(AGE)	PCI = 91.5 - 0.361(AGE)	PCI = 98.8 - 0.848(AGE)
		R^2	54.7	51.6	65.9
		T-Ratio	4.79	2.73	7.81
		SEE	5.62	5.89	5.58
		# Airports	7	n/a	n/a
		N	14	9	32

Table 4.1b Alternate regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on less than 8 inches of base material

Pavement Type	Location Category		1996 WSDOT Power Equations	1992 WSDOT Power Equations	1996 Best Fit/Alternate Equations
Asphalt, 2 - 3 inches Less than 8 inches of base	All	Equation	$PCI = 92.0 - 0.384(AGE)^{1.25}$	n/a	PCI = 78.1 - 1.39ln(AGE)
		R^2	23.1	n/a	36.6
		T-Ratio	n/a	n/a	4.93
		RMSE	18.25	n/a	16.57
		# Airports	14	n/a	14
		N	29	n/a	29
	WA	Equation	$PCI = 99.2 - 1.12(AGE)^{1.25}$	n/a	n/a
		R^2	60.5	n/a	n/a
		T-Ratio	n/a	n/a	n/a
		RMSE	17.52	n/a	n/a
		# Airports	6	n/a	6
		N	13	n/a	n/a
	OR	Equation	$PCI = 94.9 - 0.182(AGE)^{1.25}$	n/a	PCI = 87.1 - .803ln(AGE)
		R^2	50.3	n/a	80.2
		T-Ratio	n/a	n/a	8.76
		RMSE	5.9	n/a	3.72
		# Airports	7	n/a	7
		N	14	n/a	14

Table 4.2a Linear regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on more than 8 inches of base material

Pavement Type	Location Category		1996 Linear Equations	1992 Linear Equations	1988 Linear Equations
Asphalt, 2-3 inches More than 8 inches of base	All	Equation	PCI = 97.6 - 1.70(AGE)	PCI = 96.1 - 0.838(AGE)	PCI = 98.0 - 1.48(AGE)
		R^2	73	26.1	54.1
		T-Ratio	10.13	2.45	8.11
		SEE	7.16	10.39	8.37
		# Airports	13	n/a	n/a
		N	27	19	54
	WA	Equation	PCI = 98.6 - 1.69(AGE)	PCI = 96.4 - 0.853(AGE)	PCI = 100.0 - 1.08(AGE)
		R^2	71.5	20.3	51.9
		T-Ratio	5.93	1.82	3.59
		SEE	9.77	11.87	7.68
		# Airports	5	n/a	n/a
		N	11	15	12
	OR	Equation	PCI = 98.0 - 2.02(AGE)	PCI = 98.1 - 1.47(AGE)	PCI = 99.1 - 1.37(AGE)
		R^2	72.2	85.2	76.9
		T-Ratio	7.56	4.15	9.17
		SEE	4.99	1.71	4.6
		# Airports	8	n/a	n/a
		N	16	5	23

Table 4.2b Alternate regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on more than 8 inches of base material

Pavement Type	Location Category		1996 WSDOT Power Equations	1992 WSDOT Power Equations	1996 Best Fit/Alternate Equations
Asphalt, 2-3 inches More than 8 inches of base	All	Equation	$PCI = 96.3 - 0.788(AGE)^{1.25}$	n/a	$PCI = 98.1e^{-0.022(AGE)}$
		R^2	68.8	n/a	69.9
		T-Ratio	n/a	n/a	9.39
		RMSE	7.69	n/a	0.098
		# Airports	13	n/a	13
		N	27	n/a	27
	WA	Equation	$PCI = 97.4 - 0.775(AGE)^{1.25}$	n/a	n/a
		R^2	68.7	n/a	n/a
		T-Ratio	n/a	n/a	n/a
		RMSE	10.25	n/a	n/a
		# Airports	5	n/a	n/a
		N	11	n/a	n/a
	OR	Equation	$PCI = 97.1 - 1.08(AGE)^{1.25}$	n/a	n/a
		R^2	68	n/a	n/a
		T-Ratio	n/a	n/a	n/a
		RMSE	5.35	n/a	n/a
		# Airports	8	n/a	n/a
		N	16	n/a	n/a

Table 4.3a Linear regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on less than 8 inches of base material constructed during World War Two

Pavement Type	Location Category		1996 Linear Equations	1992 Linear Equations	1988 Linear Equations
World War II Less than 3 inches Asphalt. Less than 8 inches base.	All	Equation	$PCI = 100.1 - 0.966(AGE)$	n/a	n/a
		R^2	64.3	n/a	n/a
		T-Ratio	7.47	n/a	n/a
		SEE	16.03	n/a	n/a
		# Airports	10	n/a	n/a
		N	23	n/a	n/a
	WA	Equation	$PCI = 99.7 - 0.891(AGE)$	$PCI = 100.8 - 1.08(AGE)$	n/a
		R^2	70.2	70.9	n/a
		T-Ratio	7.67	n/a	n/a
		SEE	12.96	n/a	n/a
		# Airports	8	n/a	n/a
		N	19	11	n/a

Table 4.3b Alternate regression equations for flexible pavement containing 2 - 3 inches of Asphalt Concrete on less than 8 inches of base material constructed during World War Two

Pavement Type	Location Category		1996 WSDOT Power Equations	1992 WSDOT Power Equations	1996 Best Fit/Alternate Equations
World War II Less than 3 inches Asphalt. Less than 8 inches base.	All	Equation	$PCI = 100.0 - 0.368(AGE)^{1.25}$	$PCI = 100.0 - 0.0234(AGE)^{2}$	n/a
		R^2	64.4	72.1	n/a
		T-Ratio	n/a	4.82	n/a
		RMSE	16.01	9.88	n/a
		# Airports	10	n/a	n/a
		N	23	11	n/a
	WA	Equation	$PCI = 99.6 - 0.339(AGE)^{1.25}$	n/a	$66.0 - 2.11\ln(AGE)$
		R^2	69.9	n/a	70.7
		T-Ratio	n/a	n/a	7.77
		RMSE	13.03	n/a	12.85
		# Airports	8	n/a	8
		N	19	n/a	19

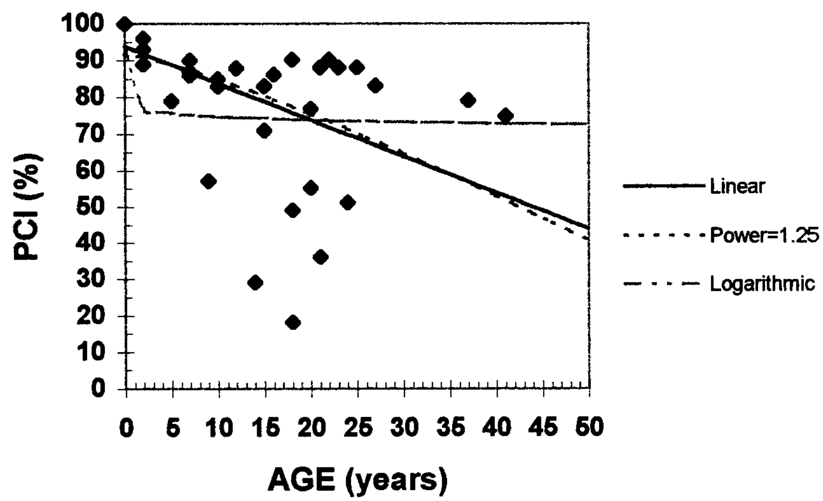

Figure 4.1 PCI vs AGE plot for flexible pavements of 2-3 inches AC on less than 8 inches base.

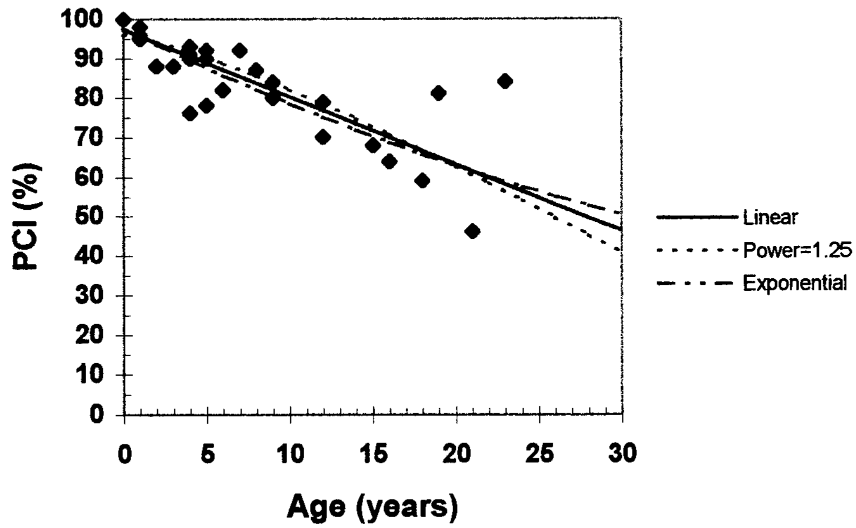

Figure 4.2 PCI vs AGE plot for flexible pavements of 2-3 inches AC on more than 8 inches base.

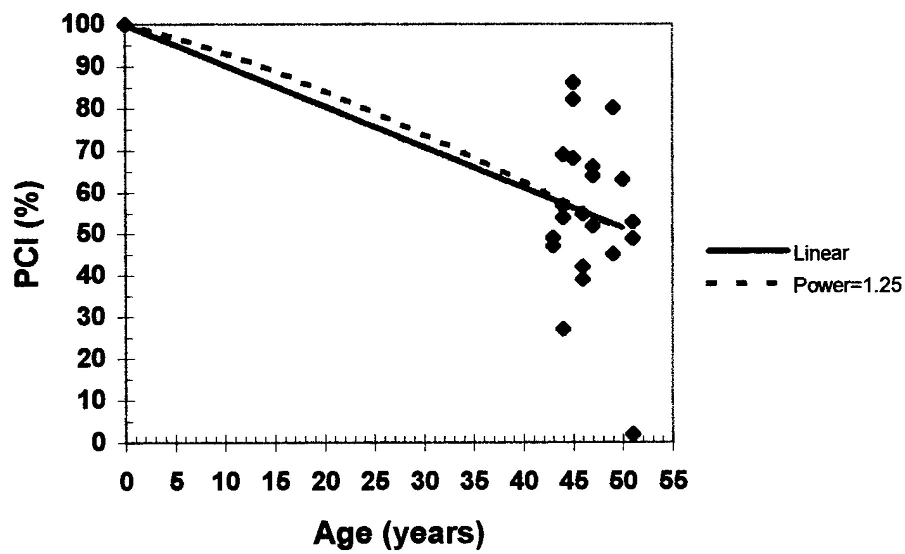

Figure 4.3 PCI vs. AGE plot for flexible pavements of 2-3 inches AC on less than 8 inches base constructed during World War Two.

4.5.1.2 Pavement Life Statistics

The difference in time between original construction and the first maintenance or repair technique or between repair techniques is referred to as pavement LIFE. For purposes of this study, it was assumed that repair or maintenance techniques were performed due to necessity, not extraneous non-structural requirements. As explained in Chapter Three, the estimated PCI percent loss per year was based upon these repairs being performed at the recommended time of a PCI at approximately 55%. Using this fact, the loss per year is simply the remaining 45% value divided by the average LIFE of the pavement section. These calculations also assume that the repair elevated the pavement PCI value to 100%, as already discussed. For example assume that a pavement demonstrated a LIFE of five years. The PCI loss per year would be calculated as follows:

$$\textit{PCI Loss per Year} = \frac{45\%}{5 \text{ years}} = 9\ \%\ \textit{Loss per year}$$

When conducting the flexible pavement LIFE analysis, two categories were used; runways constructed during World War Two and runways constructed after World War Two. These categories were further broken down based upon pavement thickness. Tables 4.4a through 4.4d list the results of the LIFE analysis from this study. LIFE analysis data from the previous studies is also presented for easy comparison.

The results obtained from this study are in very close approximation to those obtained by Floro[4]. The largest exception is seen in Table 4.4d, where the average pavement life has increased by approximately three years with a 0.5 drop in PCI loss per year.

Table 4.4a Pavement LIFE characteristics for pavements constructed during World War Two with less than 3 inches of asphalt.

Pavement Category	Study Identification	Average Life	Shortest Life	Longest Life	Average PCI Loss	Standard Deviation	Number Of Points
Less than 3 inches	1988	37.4	9	43	1.6	11.2	42
Asphalt, WWII	1992	35	21	43	1.3	5.5	33
	1996	35.7	21	47	1.3	6	34

Table 4.4b Pavement LIFE characteristics for pavements constructed during World War Two with 3 inches or more of asphalt.

Pavement Category	Study Identification	Average Life	Shortest Life	Longest Life	Average PCI Loss	Standard Deviation	Number Of Points
3 inches or greater	1988	n/a	n/a	n/a	n/a	n/a	n/a
Asphalt, WWII	1992	30.2	9	41	1.5	8.7	9
	1996	28.9	9	34	1.6	8.3	8

Table 4.4c Pavement LIFE characteristics for pavements constructed after World War Two with less than 3 inches of asphalt.

Pavement Category	Study Identification	Average Life	Shortest Life	Longest Life	Average PCI Loss	Standard Deviation	Number Of Points
Less than 3 inches	1988	12.4	3	35	3.7	7.6	20
Asphalt, Post WWII	1992	14.3	4	37	3	9.5	23
	1996	13.9	5	35	3.2	7.6	34

Table 4.4d Pavement LIFE characteristics for pavements constructed after World War Two with 3 inches or more of asphalt.

Pavement Category	Study Identification	Average Life	Shortest Life	Longest Life	Average PCI Loss	Standard Deviation	Number Of Points
3 inches or greater	1988	14	10	18	3.2	3.8	5
Asphalt, Post WWII	1992	14.9	3	37	3	10.5	8
	1996	18.1	10	27	2.5	7.5	7

4.5.2 Asphalt Concrete Overlays

Asphalt overlays were evaluated as a single group rather than being broken into thickness categories as done in the previous section. The vast majority of overlays reviewed consisted of two inch surface courses. Of the runways included in this study, the thickest overlay evaluated was five inches. FAA Advisory Circular 150/5380-6[2] indicates that within this range, the thickness of the overlay plays little role on PCI rating. Although underlying pavement may play a role in overlay durability, this was not taken into consideration due to the lack of sufficient data.

A review of the results suggests that the linear model is the best overall representation of asphalt overlays. The WSDOT power model is a very close second. Results from this study provided values higher than in the previous studies almost across the board. Only linear models were examined in the previous studies, so no comparison can be made with the curvilinear equations.

4.5.2.1 Regression Models Obtained

The following tables contain the results of the regression analysis conducted on overlay pavements. Table 4.5a contains the linear models from all three studies. Table 4.5b contains the WSDOT power model and 'best fit' alternative where applicable.

Table 4.5a Linear regression equations for Asphalt Concrete overlays on any base/subbase.

Pavement Type	Location Category		1996 Linear Equations	1992 Linear Equations	1988 Linear Equations
Asphalt Overlays	All	Equation	PCI = 98.1 - 1.62(AGE)	PCI = 90.8 - 1.03(AGE)	PCI = 98.7 - 1.54(AGE)
		R^2	71.9	23.3	58.5
		T-Ratio	16.68	3.17	11.11
		SEE	6.23	9.32	6.4
		# Airports	28	n/a	n/a
		N	58	37	88
	WA	Equation	PCI = 97.7 - 1.25(AGE)	PCI = 93.2 - 1.23(AGE)	PCI = 98.9- 1.43(AGE)
		R^2	48.3	29.5	66
		T-Ratio	6.26	3.1	8.31
		SEE	8.83	10.01	5.78
		# Airports	14	n/a	n/a
		N	30	25	36
	OR	Equation	PCI = 97.2 - 1.68(AGE)	PCI = 92.4 - 1.17(AGE)	PCI = 98.1 - 1.76(AGE)
		R^2	77	35.1	58.9
		T-Ratio	9.67	2.44	7.55
		SEE	5.28	6.99	6.6
		# Airports	10	n/a	n/a
		N	20	13	40
	ID	Equation	PCI = 101.7 - 2.35(AGE)	n/a	PCI = 98.3 - 1.30(AGE)
		R^2	73.8	n/a	25
		T-Ratio	5.31	n/a	2.16
		SEE	6.99	n/a	8.15
		# Airports	4	n/a	n/a
		N	8	n/a	12

Table 4.5b Alternate regression equations for Asphalt Concrete overlays on any base/subbase.

Pavement Type	Location Category		1996 WSDOT Power Equations	1992 WSDOT Power Equations	1996 Best Fit/Alternate Equations
Asphalt Overlays	All	Equation	$PCI = 97.1 - 0.793(AGE)^{1.25}$	n/a	n/a
		R^2	69.1	n/a	n/a
		T-Ratio	n/a	n/a	n/a
		RMSE	6.54	n/a	n/a
		# Airports	28	n/a	n/a
		N	58	n/a	n/a
	WA	Equation	$PCI = 96.8 - 0.597(AGE)^{1.25}$	n/a	n/a
		R^2	46.2	n/a	n/a
		T-Ratio	n/a	n/a	n/a
		RMSE	9.01	n/a	n/a
		# Airports	14	n/a	n/a
		N	30	n/a	n/a
	OR	Equation	$PCI = 96.3 - 0.851(AGE)^{1.25}$	n/a	n/a
		R^2	73.4	n/a	n/a
		T-Ratio	n/a	n/a	n/a
		RMSE	5.67	n/a	n/a
		# Airports	10	n/a	n/a
		N	20	n/a	n/a
	ID	Equation	$PCI = 98.8 - 0.343(AGE)^{1.75}$	n/a	n/a
		R^2	79.1	n/a	n/a
		T-Ratio	n/a	n/a	n/a
		RMSE	6.24	n/a	n/a
		# Airports	4	n/a	n/a
		N	8	n/a	n/a

Figure 4.4 graphically illustrates the regression equations obtained for the combined category. Plots of each individual state can be found in Appendix G.

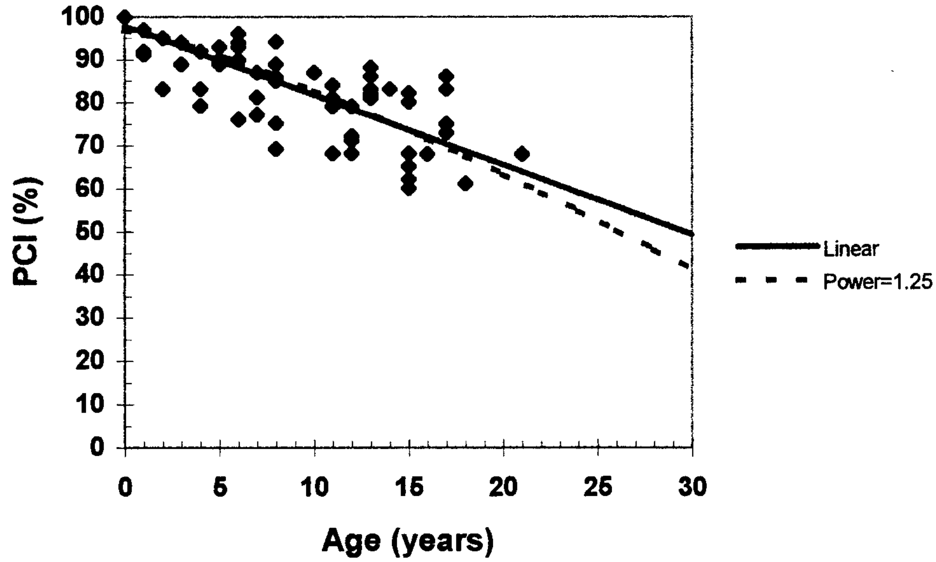

Figure 4.4 PCI vs AGE plot for asphalt overlays of any thickness on any base/subbase.

4.5.2.2 Pavement LIFE Statistics

As in the previous section, pavement LIFE was determined by subtracting the overlay repair date from the subsequent repair date. Table 4.6 lists the comparison LIFE statistics from the three studies. The 1992 results mimic the 1988 results as no pavement maintenance was recorded within that time frame. A review of the LIFE statistics indicates an increase in the average pavement life in conjunction with a dramatic jump in the standard deviation.

Table 4.6 Pavement LIFE characteristics for AC overlays of any thickness on any base/subbase.

Pavement Category	Study Identification	Average Life	Shortest Life	Longest Life	Average PCI Loss	Standard Deviation	Number Of Points
Asphalt Overlay	1988	11.6	8	16	3.9	2.6	7
	1992	11.6	8	16	3.9	2.6	7
	1996	13.1	5	21	3.4	6.3	9

4.5.3 Bituminous Surface Treatments

As stated in Chapter Three, all new construction BST pavements, whether single, double, or triple surface treatments, were evaluated as a single category. The results obtained from this survey did not easily compare with either of the previous surveys. Weisenberger's[10] study evaluated each BST treatment separately with only a combined summary comparable. Floro's[4] study examined two separate trends using only the WSDOT power model. An analysis of the combined data was not accomplished and therefore not comparable. This study looked at only the combined data equations.

A review of the results shows a significant rise in the R^2 values from the 1988 study. It appears that the logarithmic model provides the 'best fit', but it should be discounted as it does not follow typical pavement performance trends.

4.5.3.1 Regression Models Obtained

Tables 4.7a and 4.7b contain the regression equations developed and the corresponding equations from previous studies where available. Table 4.7a contains the linear models and Table 4.7b the WSDOT power and 'best fit' models.

Figure 4.5 is the graphical representation of the regression equations developed from the bituminous surface treatment analysis. Only the combined plot is shown. Plots for individual states can be found in Appendix G. Note that there appears to be two separate trends in the data plot. An analysis of the data failed to indicate any cause for this disparity. An examination was conducted on whether the pavement composition contributed to the trend. Of the pavements analyzed, six where TBST's, three were DBST's, and two were BST's. The data, therefore, failed to indicate that this played any role in the resulting outcome.

Table 4.7a Linear regression equations for all levels of bituminous surface treatments; new construction only.

Pavement Type	Location Category		1996 Linear Equations	1992 Linear Equations	1988 Linear Equations
Bituminous Surface Treatments	All	Equation	PCI = 87.9 - 2.54(AGE)	n/a	PCI = 77.1 - 1.54(AGE)
		R^2	37.2	n/a	7.8
		T-Ratio	4.43	n/a	1.51
		SEE	19.28	n/a	15.71
		# Airports	11	n/a	n/a
		N	24	n/a	16
	WA	Equation	PCI = 85.5 - 2.28(AGE)	n/a	n/a
		R^2	35.6	n/a	n/a
		T-Ratio	3.64	n/a	n/a
		SEE	19.37	n/a	n/a
		# Airports	8	n/a	n/a
		N	18	n/a	n/a
	OR	Equation	PCI = 97.6 - 3.91(AGE)	n/a	n/a
		R^2	48.7	n/a	n/a
		T-Ratio	2.58	n/a	n/a
		SEE	19.89	n/a	n/a
		# Airports	3	n/a	n/a
		N	6	n/a	n/a

Table 4.7b Alternate regression equations for all levels of bituminous surface treatments; new construction only.

Pavement Type	Location Category		1996 WSDOT Power Equations	1992 WSDOT Power Equations	1996 Best Fit/Alternate Equations
Bituminous Surface Treatments	All	Equation	$PCI = 85.5 - 1.16(AGE)^{1.25}$	n/a	PCI = 66.3 - 2.12ln(AGE)
		R^2	31.7	n/a	55.8
		T-Ratio	n/a	n/a	6.45
		RMSE	20.11	n/a	16.18
		# Airports	11	n/a	11
		N	24	n/a	24
	WA	Equation	$PCI = 83.3 - 1.03(AGE)^{1.25}$	n/a	PCI = 64.9 - 2.20ln(AGE)
		R^2	30.1	n/a	61.6
		T-Ratio	n/a	n/a	6.21
		RMSE	20.18	n/a	14.95
		# Airports	8	n/a	8
		N	18	n/a	18
	OR	Equation	$PCI = 95.9 - 2.09(AGE)^{1.25}$	n/a	n/a
		R^2	45.7	n/a	n/a
		T-Ratio	n/a	n/a	n/a
		RMSE	20.47	n/a	n/a
		# Airports	3	n/a	n/a
		N	6	n/a	n/a

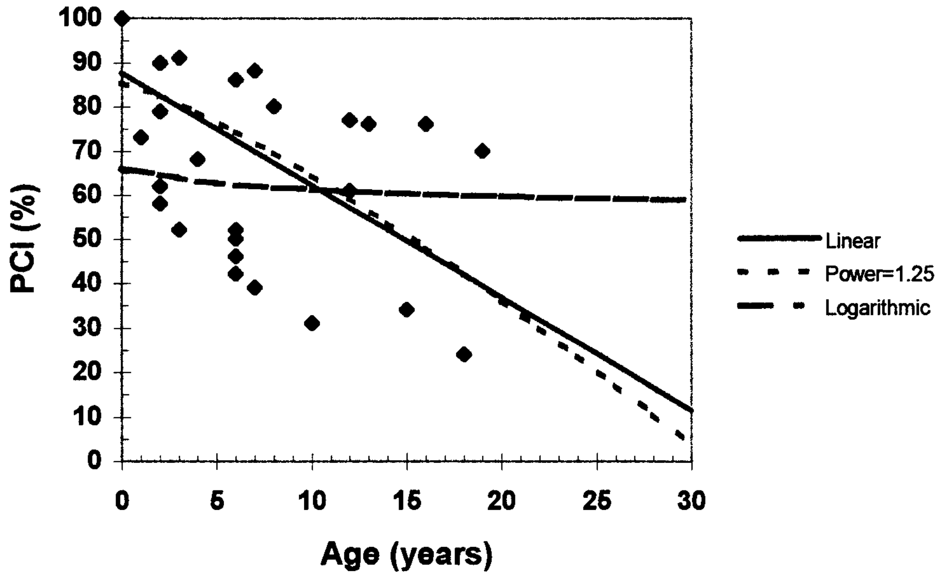

Figure 4.5 PCI vs AGE plot for bituminous surface treatments, all categories; new construction only.

4.5.3.2 Pavement LIFE Statistics

Pavement LIFE for bituminous surface treatments was obtained identically to asphalt pavement LIFE. Several additional pavements were reviewable in this study compared to the previous studies. While life did not change dramatically from the 1992 study, the standard deviation increased significantly. This increase is most likely due to the large increase in the number of data points analyzed. Table 4.8 lists the LIFE statistics for the bituminous surface treatments reviewed.

Table 4.8 Pavement LIFE statistics for Bituminous Surface Treatments

Pavement Category	Study Identification	Average Life	Shortest Life	Longest Life	Average PCI Loss	Standard Deviation	Number Of Points
Bituminous Surface	1988	9.2	1	29	4.9	6.4	22
Treatment	1992	14.4	11	17	3.1	2.2	5
	1996	13.6	2	36	3.3	9.1	34

4.5.4 Slurry Sealed Pavements

Two surface maintenance techniques were reviewed in the course of this study. The first of these is the slurry seal. This is a very common repair method for runways, providing a large number of data points. As with bituminous surface treatments, data comparison was difficult to accomplish due to the variations in data treatment between surveys. Floro[4] once again analyzed two separate trends, using only WSDOT power models. This time the combined data was reviewed however, and is included in Table 4.9b for comparison. Weisenberger[10] reviewed slurry seals, but only as a group. Individual state statistics are not available for comparison.

The statistical results from this study are considerably better than in previous studies, but are in no way statistically significant. In large part, this is due the wide variation in material types and application procedures. The assumption of an initial PCI of 100% at AGE zero may not be valid either. This is noted with pavements that possess lower PCI values at young ages.

4.5.4.1 Regression Models Obtained

Tables 4.9a and 4.9b contain the regression equations developed from analysis of the slurry sealed pavements. Table 4.9a contains the linear equations developed and Table 4.9b the WSDOT power models and 'best fit' equations where applicable. Note that the highest R^2 value was provided by a logarithmic model.

Table 4.9a Linear regression equations for slurry sealed pavements

Pavement Type	Location Category		1996 Linear Equations	1992 Linear Equations	1988 Linear Equations
Slurry Seals	All	Equation	PCI = 89.0 - 2.87(AGE)	n/a	PCI = 74.0 - 0.25(AGE)
		R^2	52.4	n/a	0
		T-Ratio	7.71	n/a	0.46
		SEE	15.9	n/a	16.11
		# Airports	18	n/a	n/a
		N	38	n/a	24
	WA	Equation	PCI = 88.7 - 2.54(AGE)	n/a	n/a
		R^2	52.2	n/a	n/a
		T-Ratio	6.27	n/a	n/a
		SEE	14.89	n/a	n/a
		# Airports	12	n/a	n/a
		N	25	n/a	n/a
	ID	Equation	PCI = 94.0 - 4.10(AGE)	n/a	n/a
		R^2	63.9	n/a	n/a
		T-Ratio	4.21	n/a	n/a
		SEE	19.05	n/a	n/a
		# Airports	4	n/a	n/a
		N	8	n/a	n/a

Table 4.9b Alternate regression equations for slurry sealed pavements

Pavement Type	Location Category		1996 WSDOT Power Equations	1992 WSDOT Power Equations	1996 Best Fit/Alternate Equations
Slurry Seals	All	Equation	$PCI = 86.3 - 1.31(AGE)^{1.25}$	$PCI = 72.6- 0.2(AGE)^{1.5}$	PCI = 65.6 - 2.18ln(AGE)
		R^2	45.4	18	64.6
		T-Ratio	n/a	2.15	9.93
		RMSE	17.04	13.11	13.71
		# Airports	18	n/a	18
		N	38	23	38
	WA	Equation	$PCI = 86.1 - 1.13(AGE)^{1.25}$	n/a	PCI = 66.9 - 2.09ln(AGE)
		R^2	44.5	n/a	69.4
		T-Ratio	n/a	n/a	9.04
		RMSE	16.04	n/a	11.91
		# Airports	12	n/a	12
		N	25	n/a	25
	ID	Equation	$PCI = 91.7 - 2.05(AGE)^{1.25}$	n/a	n/a
		R^2	60.9	n/a	n/a
		T-Ratio	n/a	n/a	n/a
		RMSE	19.84	n/a	n/a
		# Airports	4	n/a	4
		N	8		n/a

Figure 4.6 graphically illustrates the regression equations developed for the combined category. Individual state plots can be found in Appendix G.

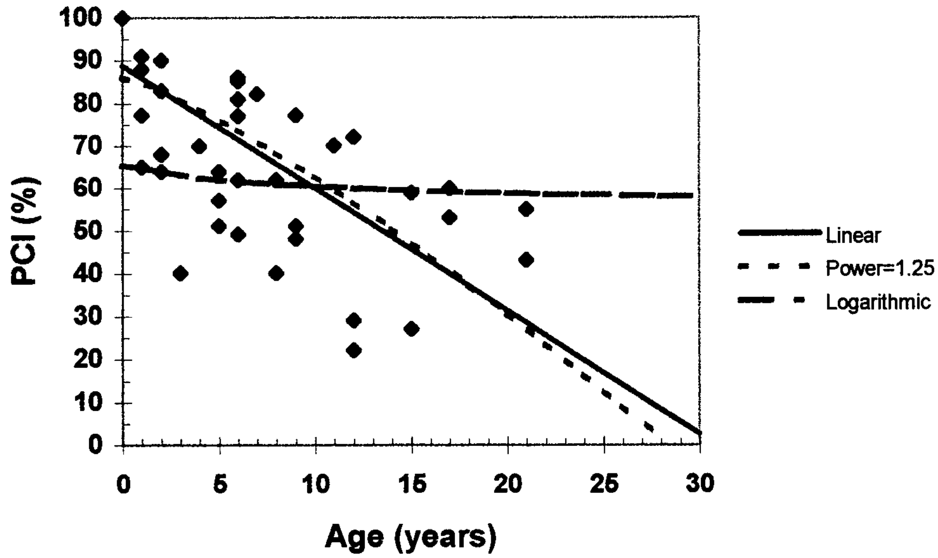

Figure 4.6 PCI vs AGE plot for slurry sealed pavements

4.5.4.2 Pavement LIFE Statistics

Since slurry seal application is almost solely a maintenance technique, pavement LIFE statistics were determined by subtracting the original application date from any follow on maintenance application. Although widely used, very few slurry sealed pavements had received a repair treatment, thereby presenting very few data points. A 1992 review was not conducted on the LIFE data. When compared to the 1988 survey, the 1996 results are very similar across the board. Table 4.10 contains the LIFE statistics for slurry sealed pavements.

Table 4.10 Pavement LIFE characteristics for slurry sealed pavements.

Pavement Category	Study Identification	Average Life	Shortest Life	Longest Life	Average PCI Loss	Standard Deviation	Number Of Points
Slurry Seal	1988	5.6	3	10	8	3	6
	1992	n/a	n/a	n/a	n/a	n/a	n/a
	1996	4.1	1	9	11	2.7	7

4.5.5 Chip Sealed Pavements

The second maintenance technique reviewed was pavements that had been chip sealed. The chip seal category included all pavements labeled as chip seals or BSTs applied as maintenance techniques. These were not included in the new construction BST category. A comparison to the prior studies proved difficult. Floro[4] did not review chip seals as a separate category. Weisenberger[10] performed only linear regression and did not break categories down into states. Theoretically, maintenance chip seals should behave similarly to new construction BSTs due to their virtually identical construction process. A review of the regression models for both demonstrates that this is a fairly accurate assumption. The chip sealed pavements performed slightly better, most like due to the more substantial base course (existing pavement).

4.5.5.1 Regression Models Obtained

Tables 4.11a and 4.11b contain the regression equations developed from analysis of the chip sealed pavements. Table 4.11a contains the linear models obtained and Table 4.11b contains the WSDOT power models and 'best fit' alternative.

Table 4.11a Linear regression equations for chip seal pavements.

Pavement Type	Location Category		1996 Linear Equations	1992 Linear Equations	1988 Linear Equations
Chip Seals	All	Equation	PCI = 89.8 - 2.51(AGE)	n/a	PCI = 77.6 - 1.46(AGE)
		R^2	46.4	n/a	21.4
		T-Ratio	4.37	n/a	2.54
		SEE	17.54	n/a	16.25
		# Airports	8	n/a	n/a
		N	16	n/a	20
	WA	Equation	PCI = 90.0 - 2.96(AGE)	n/a	n/a
		R^2	39	n/a	n/a
		T-Ratio	2.88	n/a	n/a
		SEE	18.99	n/a	n/a
		# Airports	5	n/a	n/a
		N	10	n/a	n/a

Table 4.11b Alternate regression equations for chip seal pavements.

Pavement Type	Location Category		1996 WSDOT Power Equations	1992 WSDOT Power Equations	1996 Best Fit/Alternate Equations
Chip Seals	All	Equation	$PCI = 87.5 - 1.15(AGE)^{1.25}$	n/a	PCI = 65.9 - 2.15ln(AGE)
		R^2	39.7	n/a	63.8
		T-Ratio	n/a	n/a	6.23
		RMSE	18.61	n/a	14.42
		# Airports	8	n/a	8
		N	16	n/a	16
	WA	Equation	$PCI = 87.7 - 1.41(AGE)^{1.25}$	n/a	PCI = 69.0 - 1.96ln(AGE)
		R^2	32.7	n/a	52.4
		T-Ratio	n/a	n/a	3.78
		RMSE	19.95	n/a	16.78
		# Airports	5	n/a	5
		N	10	n/a	10

Figure 4.7 graphically demonstrates the equations developed for chip sealed pavements. Only the combined data plot is shown. Plots for each individual state possessing data can be found in Appendix G.

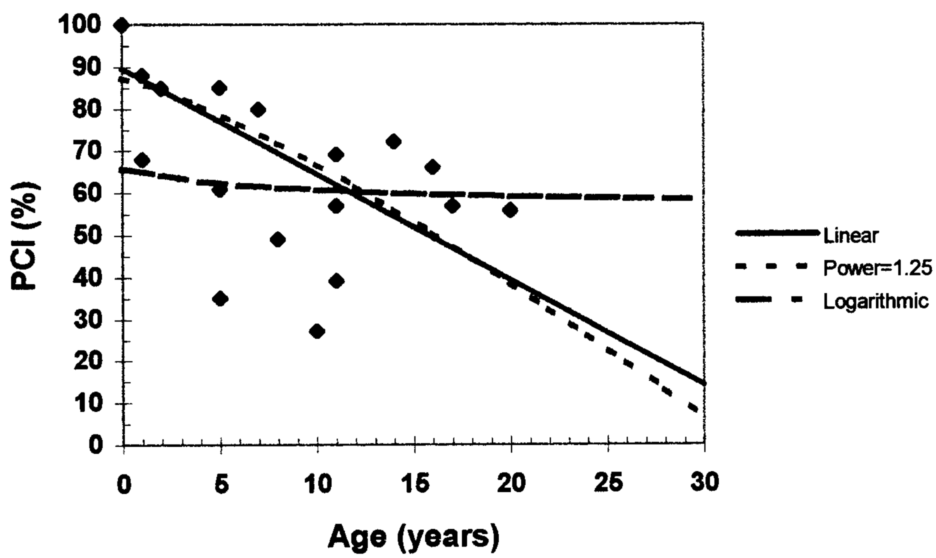

Figure 4.7 PCI vs AGE plot for chip sealed pavements.

4.5.5.2 Pavement LIFE Statistics

It was not possible to calculate pavement LIFE statistics for chip sealed pavements; too few data points existed to give a valid statistical outcome. This is primarily due to the fact that this is solely a maintenance application category. Few runways possessing chip seals had been rehabilitated.

4.6 Discussion of Results

A large amount of information was generated and reviewed in the course of this research project. Most of the performance trends observed were already mentioned in each section. During the course of this project, however, several areas were highlighted that will be touched on in this section.

4.6.1 Airport Pavement Performance

A review of the data indicates airport pavements that seem to have unusually long life spans. It is typical for an asphalt concrete pavement to have a life span of about 12 to 15 years[11]. Many of the airports reviewed in this study have life spans beyond 30 years. This seems to be highly unlikely, but no data exists to suggest otherwise.

It is almost difficult to compare pavement performance between Idaho, Oregon, and Washington. Depending upon the pavement type and the regression model reviewed, each state performed better on some and worse on others. No hard results could be obtained from the data. It is interesting to note, however, that there were significantly more data points available for Washington than either Idaho or Oregon.

In highway pavements, the thickness of the asphalt concrete and base layers plays a vital role in pavement durability. In airport pavements, however, the results indicate that thickness plays little role in pavement durability. This is most likely due to the significantly lighter loads encountered on a general aviation runway than on most highway pavements.

4.6.2 Surface Maintenance Techniques

The greatest difference in LIFE results came from the surface maintenance techniques reviewed. Slurry seals and chip seals deteriorated much faster than any of the new pavements. This is most likely due to the assumption of resetting the PCI/AGE clock upon maintenance application as has already been explained.

A review of the PCI/AGE surveys reveals that surface maintenance applications are most often applied as tools to extend the existing pavement life. This fact is backed by data showing little increase in the pavement PCI percentage immediately after the maintenance application. Most of these repairs do not provide long term solutions. In fact, it appears as though the underlying pavement plays a greater role in the performance of the maintenance application than any other fact. Any deficiencies in the underlying pavement usually transfer through the maintenance application. On the positive side, asphalt concrete overlays resulted in equations and LIFE determinations that demonstrate strong statistical predictablity. Chip seals and slurry seals, on the other hand, suggest the importance of knowing existing conditions before trying to predict future performance.

4.6.3 Equation Models

Much has already been addressed regarding the regression equations utilized in this study. The most predominant models utilized in the regression results were the linear, WSDOT power, and logarithmic models. As previously explained the logarithmic models, although providing the highest R^2 values in many cases, do not conform to typical pavement performance models. In other words, they predict an almost infinite life for each pavement. Even though shown on the graphical plots where applicable, they should not be utilized for any form of pavement evaluation.

The linear and WSDOT models often provided fairly similar results. It was anticipated that the WSDOT model would consistently provide the 'best fit' as in highway pavements, but in many instances, the linear model was statistically better represented. The linear model, although very simple, actually has many strengths. In fact the very nature of its simplicity makes it easy to work with in many ways. It is plotted fairly easily, provides an easily determinable slope to predict deterioration, and requires no advanced system to compute. Ideally, however, the WSDOT power model should be more widely utilized. It provides a much more realistic model of actual pavement performance.

5.0 Summary and Recommendations

5.1 Summary

The intent of this paper was to develop regression models capable of forecasting airfield pavement performance. These models could be utilized by airport managers to more efficiently maintain their pavement management systems. The models were developed utilizing all available data from the Federal Aviation Administration for the states of Idaho, Oregon, and Washington. Given that climate plays a significant role in pavement performance, it is most likely that the equations developed in this study will not be applicable to many other areas of the country. In addition to the climate uncertainty, the equations generated by the study were not statistically strong. In other words, they did little to accurately predict future pavement performance, but rather indicated only general trends.

Regardless of the outcome, this study served to illustrate many of the pitfalls involved in establishing accurate regression models. The most important factor in developing quality regression models is good data. The data utilized in this study had many inaccuracies, generating little confidence in its validity. It served well for providing general trend models, but lacked enough depth or information to produce accurate prediction models. Inconsistent terminology, inspector subjectivity, poor maintenance records, and superficial procedures were only a few of the problems contributing to the inadequate data.

Timeliness was also a major concern. PCI surveys are usually conducted every three to four years on each airport. This survey had hoped to examine airfields containing three valid data points. Unfortunately, very few airports possessed this number of points due to the large time spread between surveys. Many airports had further maintenance accomplished within that time span. This essentially reset the PCI/AGE clock and eliminated future data points from contributing to the pavement modeling. Timing has also impacted the number of surveys completed. Washington has put a halt to conducting PCI surveys with no money budgeted for future surveys. This could effectively eliminate any future study of regional airfield pavement performance.

Many assumptions were made during the course of this study to overcome the lack of information in the data. Often these assumptions could significantly alter the resulting statistical analysis. Different assumptions were made in each of the three studies performed, prohibiting accurate comparisons from being made. Often, this was dictated as the data changed over time. It was more difficult to break the data into well defined categories with each subsequent report. This was due solely to data availability and the information contained within that data.

An example of how an assumption impacts the results is observed by examining whether the maintenance applications were required or preventive. The data did not spell out which, so the assumption was made that all new pavement applications were done because the existing surface was unstable. This assumption could significantly alter the pavement life calculations and could influence the overall pavement condition. More information needs to be obtained in this, and all areas to successfully predict pavement performance.

5.2 Recommendations

Several actions could be taken that would further progress the results of this study. As previously mentioned, this study dealt only with airfield runways. Other pavement features, such as taxiways and aprons, are also integral parts of an airport. A future study could examine the pavement conditions and develop regression models, adding another tool to the airport manager's pavement management system.

In any future studies, an attempt should be made to eliminate the assumptions that were utilized to complete this study. For example, a survey could be conducted after each maintenance application in order to establish baseline PCI figures. This would help eliminate the assumption of resetting the PCI/AGE clock after a maintenance application. Cost and time could be prohibitive in conducting these additional surveys, but the extra data could contribute to more statistically significant models.

The author believes that through utilization of the models developed in this study, an airport manager will be able to more accurately predict future pavement performance. This will allow for better planning and budgeting and increase the efficient use of the resources available.

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APPENDIX A

Summary of PCI Survey

Content and Procedure

There is a considerable amount of data included in a PCI survey on any given airfield. It may come from many sources, but the majority of information is drawn from construction and maintenance records maintained by the airport and from previous pavement condition surveys. Regardless of locale, the information gathered serves to provide a solid record of the airport's history. The following items should be included in each PCI survey that is conducted:

1) Design, construction, and maintenance history -- All data from original construction of the airport pavement system to the present should be maintained. Any maintenance projects, repair projects, or physical changes to the pavement system should be readily available.

2) Traffic history -- The amount and type of traffic utilizing the airport should be recorded and kept up-to-date.

3) Climatological data -- The airport should be able to provide routine weather data for the vicinity of the airport to include annual temperature ranges and precipitation.

4) Airport layout -- Redline drawings of all major airport components should be maintained.

5) Frost action -- Frost tends to heavily impact pavement performance. Any pavement actions observed due to frost should be noted.

6) Photographs -- Regular photographs should be taken detailing general and specific airport conditions.

7) Pavement condition survey reports -- All previous PCI surveys should be available for reference in the current survey.

As already mentioned, the Pavement Condition Index rating system was developed by the U.S. Army Corps of Engineers. It is a straightforward system that can be broken into nine fairly distinct steps. The following is a brief outline of the actions required.

1) Divide the airport pavement into features and increments -- All airport pavements must be divided up based upon pavement design, construction history, and traffic area. A pavement feature will have consistent structural thickness and materials, be constructed at the same time, and be located in one airport facility, i.e., runway, taxiway,

etc. Once the airfield is segmented, an initial survey needs to be done to determine the amount and varying degrees of distress in the different pavement areas.

2) Divide each pavement feature into sample units -- Both flexible and rigid pavements have different requirements. The bottom line is a given number of slabs for PCC pavement and a set square footage for flexible pavement.

3) Inspect and record distress type, severity, and density -- Guidelines are included in AC 150/5380-6 for identifying pavement distress and severity.

4) Determine deduct values -- Each distress type, density, and severity level has an appropriate deduct value determined from published curves.

5) Find total deduct value (TDV) -- All deduct values for each distress condition observed are summed.

6) Find corrected deduct value (CDV) -- Both rigid and flexible pavements have specific procedures outlined for adjusting the TDV.

7) Determine Pavement Condition Index -- For each sample unit inspected use the following formula to determine PCI:

$$PCI = 100 - CDV$$

8) Determine PCI value for total feature -- The average of all sample unit PCI's gives the PCI value for the total feature.

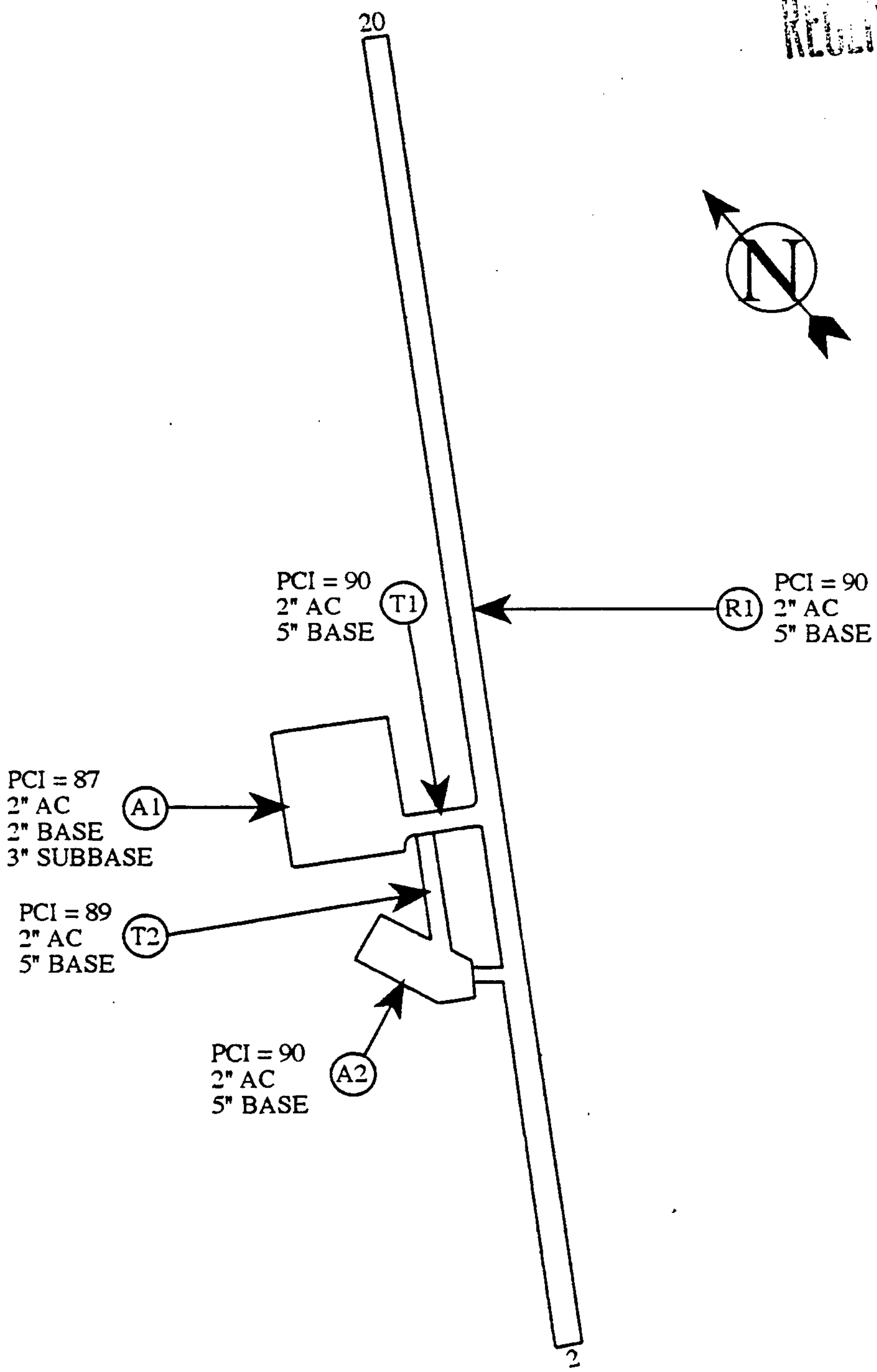
9) Cross PCI with verbal description -- Each PCI value has a corresponding verbal description.

The above steps demonstrate that the rating system is fairly straightforward. By having a standardized procedure in place, the FAA can better regulate the quality and repeatability of ongoing surveys. When these procedures are followed, the confidence level of the data ranges from 92% to 95% depending upon the size of the sample area. The lower confidence value is related to a smaller inspection area. The confidence level indicates the probability that an obtained value from the survey will fall within a percentage range of 10%(±5%) to 16%(±8%) of representing the entire pavement feature being surveyed.[4]

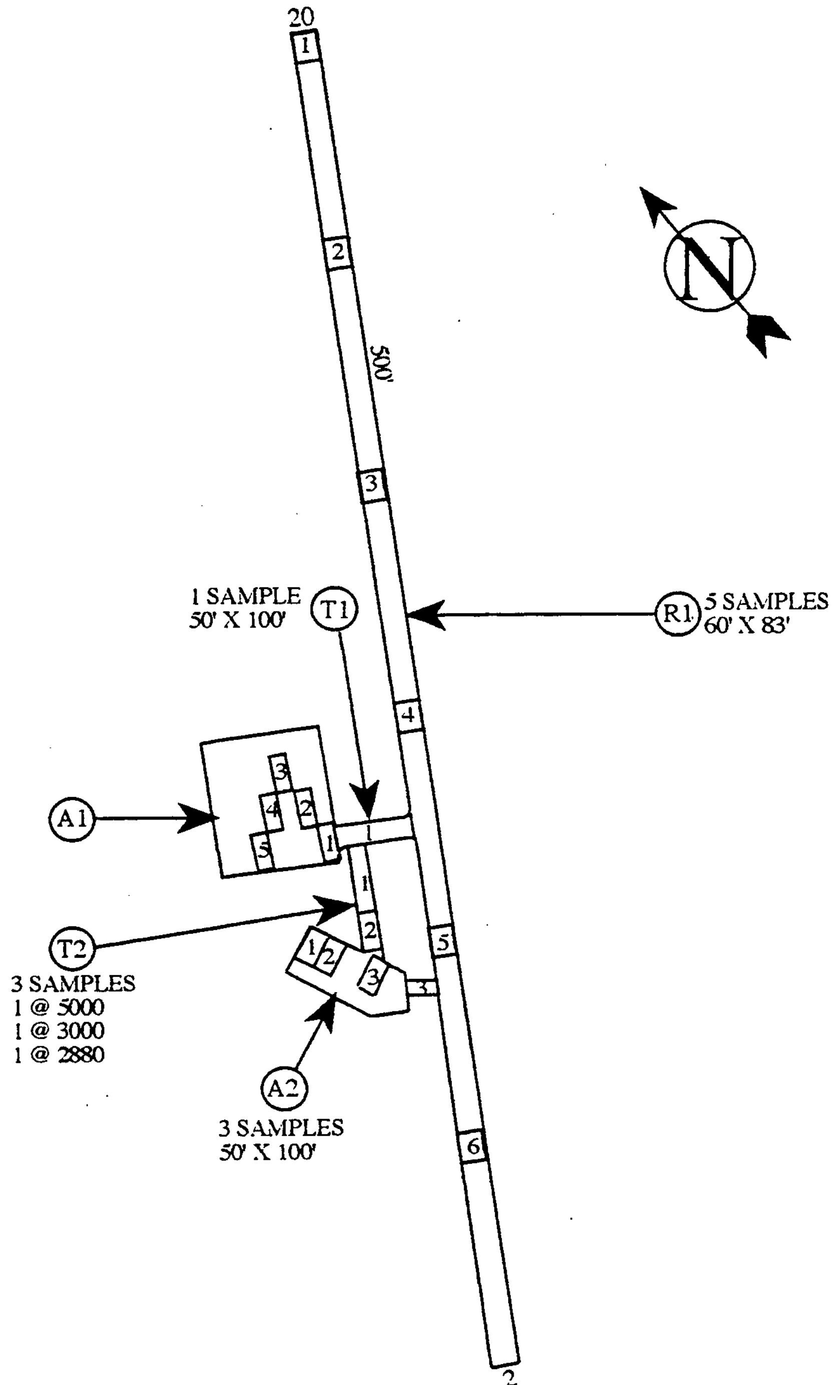
APPENDIX B

Example PCI Survey

Washington



LAKE CHELAN MUNICIPAL AIRPORT
PAVEMENT FEATURES AND PCI NUMBERS
MARCH, 1993



LAKE CHELAN MUNICIPAL AIRPORT
LOCATION OF SAMPLE UNITS WITHIN EACH FEATURE
MARCH, 1993

Lake Chelan Municipal Airport
Pavement Maintenance and Development Report
March, 1993

The pavements at this airport were last inspected during June, 1988.

A paved runway has existed at this location for many years. A State project provided widening, seal coat and other improvements in 1976. The pavements as they exist today are a result of projects accomplished during 1986 and 1987. In 1986 the runway was widened from 45' to 60' and a new 2" AC surface applied. The large tiedown apron A1 and it's stub taxiway were also constructed in 1986. The service apron A2 and two short taxiway segments were constructed during 1987.

Currently, all of the pavements remain in excellent condition. Minor cracking has developed since the last inspection along with some raveling and weathering. A fog seal should be applied sometime in the next 2-3 years to check the raveling and the cracks should be sealed also.

PAVEMENT FEATURE SUMMARY

Airport Facility: Runway
Total Number of Sample Units: 6

Sample Unit Number	Sample Unit Area	PCI
1	5000	76
2	5000	90
3	5000	95
4	5000	85
5	5000	97
6	5000	97

Average PCI: 90
Condition Rating: Excellent

Airport Facility: Taxiway T1
Total Number of Sample Units: 1

Sample Unit Number	Sample Unit Area	PCI
1	5130	90

Average PCI: 90
Condition Rating: Excellent

Airport Facility: Taxiway T2
Total Number of Sample Units: 3

Sample Unit Number	Sample Unit Area	PCI
1	5000	91
2	5000	85
3	5000	93

Average PCI: 89
Condition Rating: Excellent

Airport Facility: Apron A1
Total Number of Sample Units: 5

Sample Unit Number	Sample Unit Area	PCI
1	5000	88
2	5000	89
3	5000	87
4	5000	87
5	5000	88

Average PCI: 87
Condition Rating: Excellent

Airport Facility: Apron A2
Total Number of Sample Units: 3

Sample Unit Number	Sample Unit Area	PCI
1	5000	89
2	5000	90
3	5000	91

Average PCI: 90
Condition Rating: Excellent

PRINCIPAL DISTRESSES:

Runway Minor cracking; depressions; raveling

Taxiway T1 Depressions; oil spillage; raveling

Taxiway T2 Depressions; raveling

Apron A1 Minor cracking; oil spillage; depressions; raveling

Apron A2 Same as A1

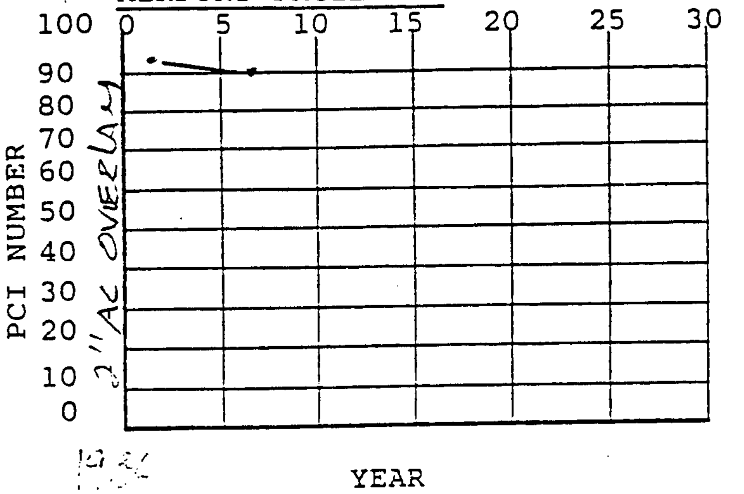
PAVEMENT CONDITION TREND

AIRPORT: LAKE CHELAN MUNICIPAL

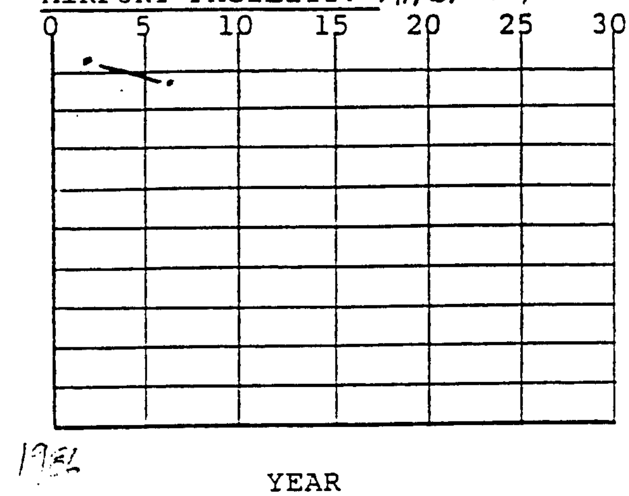
DATE OF LAST SURVEY: JUNE 1988
MARCH, 1993

NOTES. PCI NUMBER indicates PAVEMENT CONDITION INDEX
Horizontal scale covers 30 yrs.
Year 0 is year of original construction, major reconstruct. or overlay

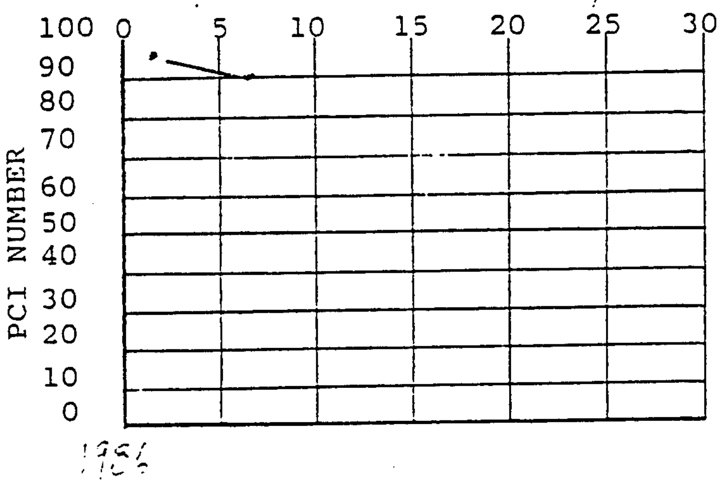
AIRPORT FACILITY:



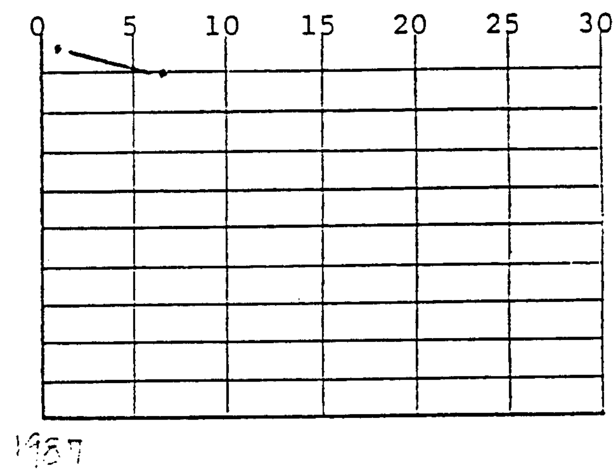
AIRPORT FACILITY: APRON A1



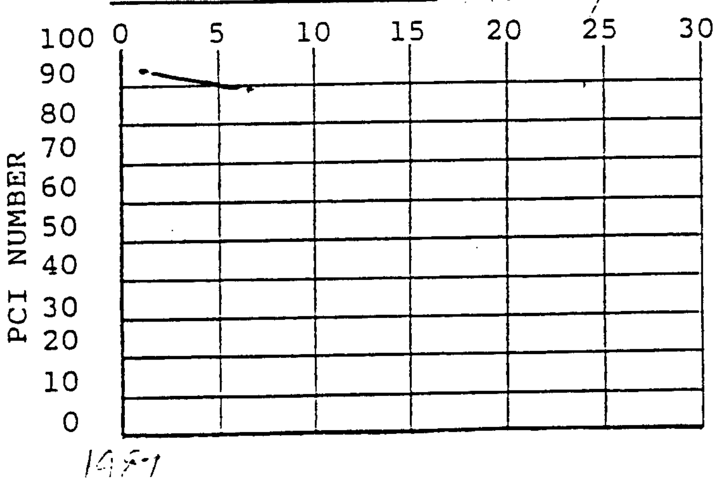
AIRPORT FACILITY: TAXIWAY T1



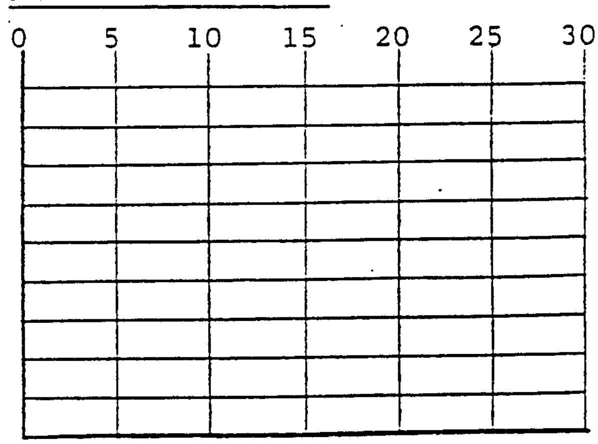
AIRPORT FACILITY: APRON A2



AIRPORT FACILITY: TAXIWAY T2



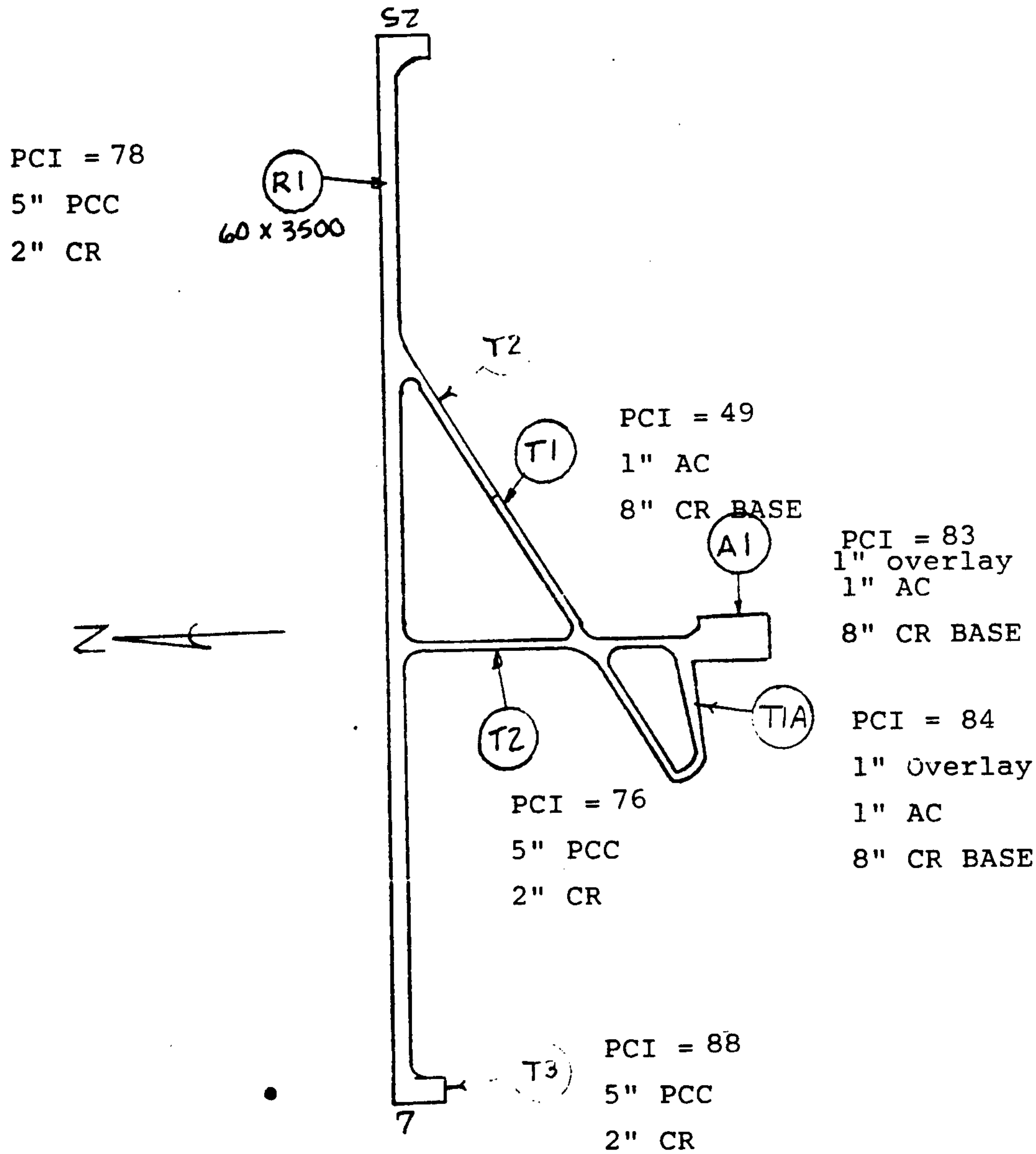
AIRPORT FACILITY:



APPENDIX C

Example PCI Survey

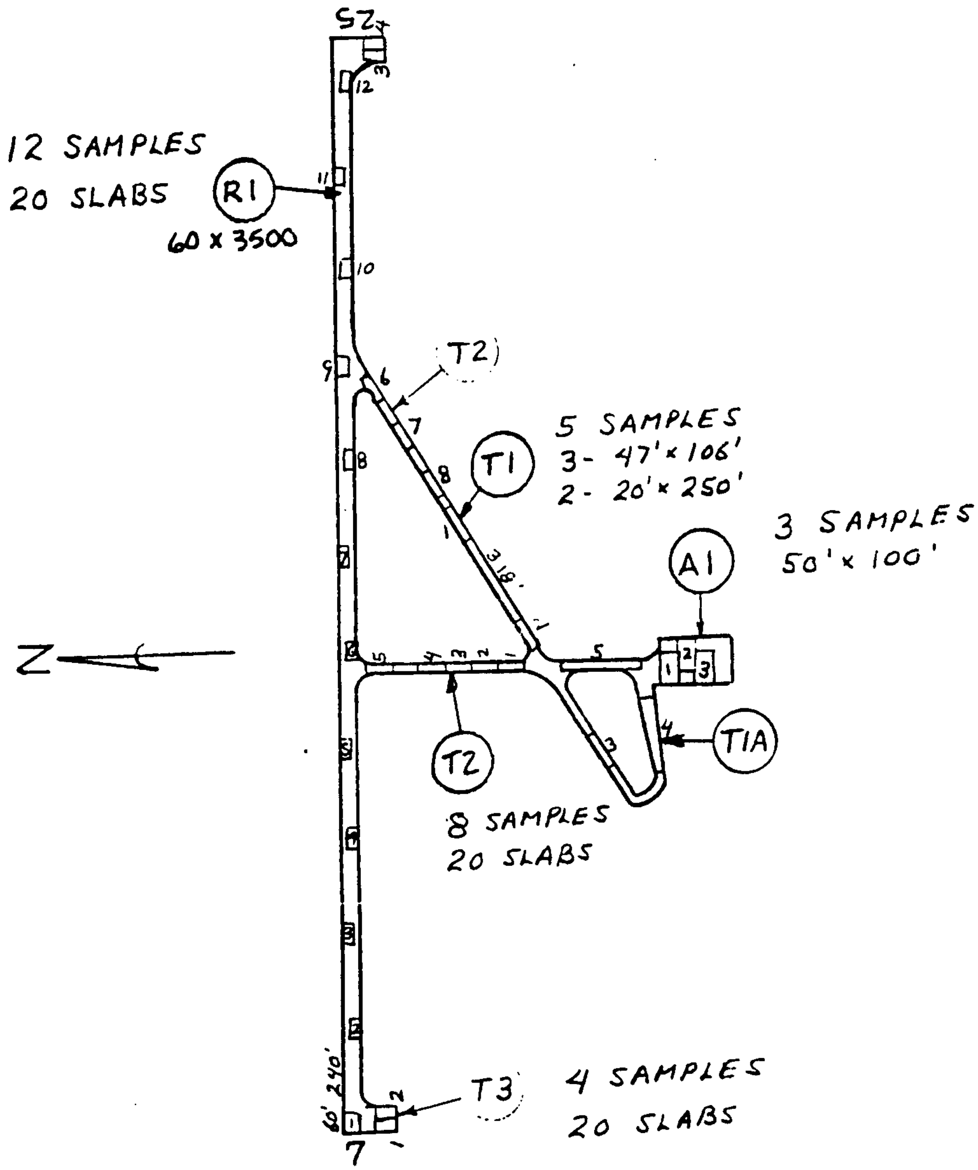
Oregon



CONDON STATE AIRPORT

PAVEMENT FEATURES AND PCI NUMBERS

JUNE 3, 1991



CONDON STATE AIRPORT
LOCATION OF SAMPLE AREAS WITHIN EACH FEATURE
JUNE 3, 1991

FEATURE SUMMARY

AIRPORT: Condon State Airport

DATE OF SURVEY: June 3, 1991

AIRPORT FACILITY: Runway 1

TOTAL NO. OF SAMPLE UNITS: 12

SAMPLE UNIT NO.	SAMPLE UNIT AREA	PCI
1	20 Slabs	85
2	" "	88
3	" "	85
4	" "	72
5	" "	66
6	" "	92
7	" "	70
8	" "	63
9	" "	74
10	" "	72
11	" "	87
12	" "	86

Average PCI: 78

Condition Rating: Very Good

AIRPORT FACILITY: Taxiway 1

TOTAL NO. OF SAMPLE UNITS: 3

SAMPLE UNIT NO.	SAMPLE UNIT AREA	PCI
1	5000	47
2	5000	53
3	5000	47

Average PCI: 49

Condition Rating: Fair

AIRPORT FACILITY: Taxiway 1A

TOTAL NO. OF SAMPLE UNITS: 2

SAMPLE UNIT NO.	SAMPLE UNIT AREA	PCI
4	5000	84
5	5000	84

Average PCI: 84

Condition Rating: Very Good

AIRPORT FACILITY: Taxiway 2

TOTAL NO. OF SAMPLE UNITS: 8

SAMPLE UNIT NO.	SAMPLE UNIT AREA	PCI
1	20 Slabs	94
2	" "	54
3	" "	40
4	" "	46
5	" "	96
6	" "	91
7	" "	91
8	" "	92

Average PCI: 76

Condition Rating: Very Good

AIRPORT FACILITY: Taxiway 3

TOTAL NO. OF SAMPLE UNITS: 4

SAMPLE UNIT NO.	SAMPLE UNIT AREA	PCI
1	20 Slabs	96
2	" "	90
3	" "	82
4	" "	84

Average PCI: 88

Condition Rating: Excellent

AIRPORT FACILITY: Apron

TOTAL NO. OF SAMPLE UNITS: 3

SAMPLE UNIT NO.	SAMPLE UNIT AREA	PCI
1	5000	78
2	5000	89
3	5000	82

Average PCI: 83

Condition Rating: Very Good

PRINCIPAL DISTRESSES:

RUNWAY - Corner breaks, longitudinal/transverse/diagonal cracking and spalling joints

TAXIWAY T 1 - Block, longitudinal/transverse cracking plus ravelling

TAXIWAY T 1 A - Longitudinal and transverse cracking plus ravelling

TAXIWAY T 2 - Longitudinal/transverse cracking and spalling joints

TAXIWAY T 3 - Some cracking plus spalling joints and corners

APRON Longitudinal and transverse cracking plus some depressions and ravelling

CONDON STATE AIRPORT

PAVEMENT MAINTENANCE AND DEVELOPMENT

JUNE 3, 1991

The original pavements at Condon State Airport were constructed prior to 1966 with an 8" crushed aggregate base and 1" blade mix asphalt surface. A seal coat was applied during the summer of 1975. A new concrete runway 3500' x 60' with turnarounds and two taxiways 30' wide was constructed during 1986. The concrete is at least 5" thick and was placed on a 1" - 2" crushed rock leveling course. In 1989 the apron and a portion of the taxiway were overlaid 1"+ using a blade mix asphalt surfacing. Traffic at this airport consists mainly of single engine aircraft with ag aircraft operations being a significant portion.

Currently, the concrete pavements are in very good condition. But, they do show significant deterioration in the past 4 years. This is particularly noticeable in some of the longitudinal cracking which has progressed from low severity to medium and even high severity due to spalling with a good deal of loose or missing particles. The bituminous paved taxiway that used to be the runway is in fair condition with a lot of cracks and raveling. It could be crackfilled and slurry or chip sealed. Or, the surface could be pulverized or removed and replaced with a new 30' wide surface. The narrow taxiways now are very good as is the apron with some fine cracks and raveling the main problems.

Suggested minimum maintenance program is as follows:

Taxiway T 1	Fine chip seal for 30' width		
	4000 S.Y. @ $1.40	=	$5600.00
	Crackfilling 5000 L.F. @ $1.10	=	$5500.00

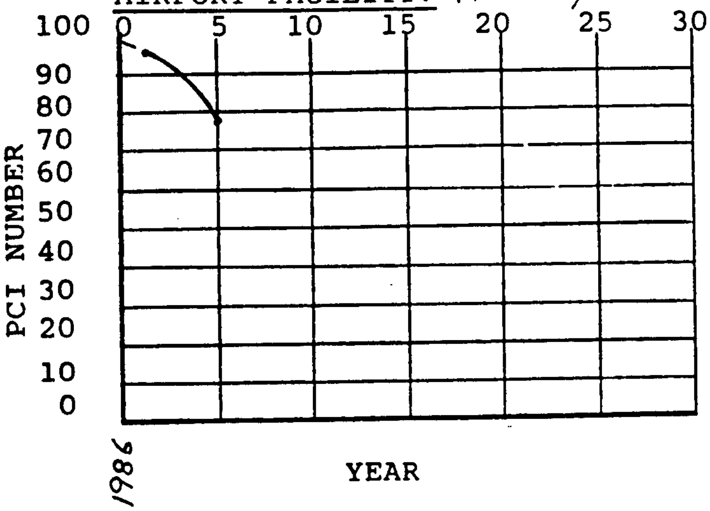
PAVEMENT CONDITION TREND

AIRPORT: Condon State

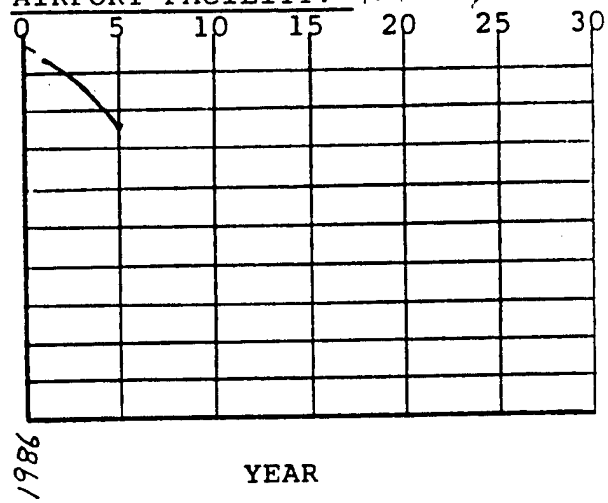
DATE OF LAST SURVEY: June 3, 1991

NOTES: PCI NUMBER indicates PAVEMENT CONDITION INDEX
Horizontal scale covers 30 yrs.
Year 0 is year of original construction, major reconstruct. or overlay

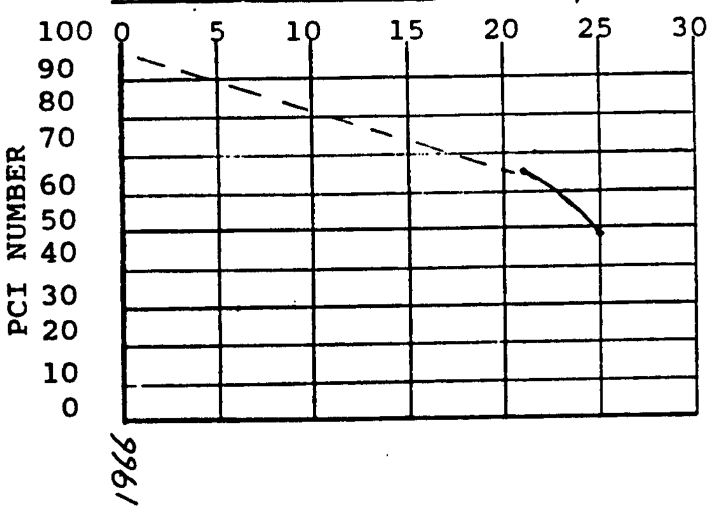
AIRPORT FACILITY: Runway R1



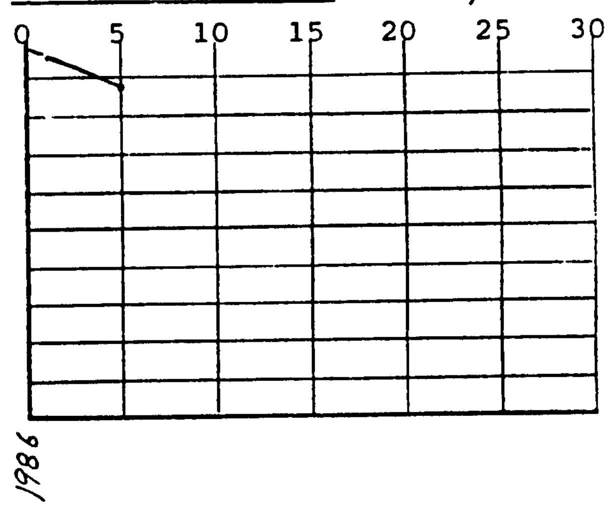
AIRPORT FACILITY: Taxiway T2



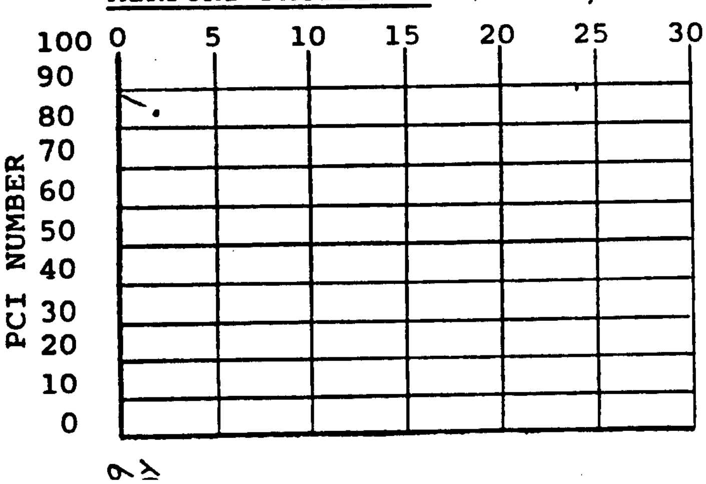
AIRPORT FACILITY: Taxiway T1



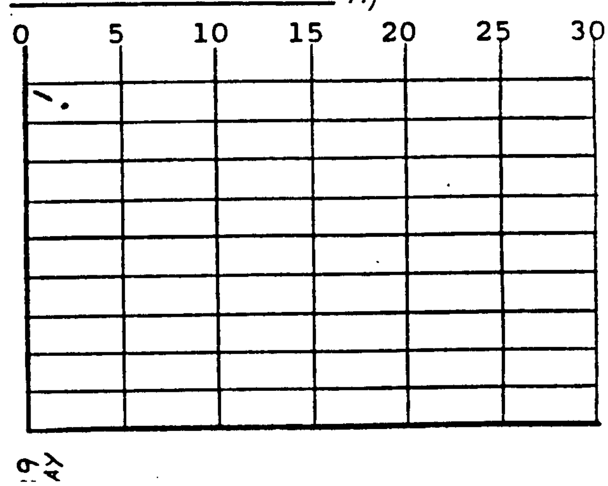
AIRPORT FACILITY: Taxiway T3



AIRPORT FACILITY: Taxiway T1A



AIRPORT FACILITY: Apron A1



APPENDIX D

Example PCI Survey

Idaho

PRIEST RIVER AIRPORT

This appendix presents the results of the pavement management system implementation for Priest River Airport, conducted as part of the Idaho Division of Aeronautics State System Plan.

DATA COLLECTION

A records review was conducted to determine pavement structure and age. Table PR-1 contains the cross-section information for each pavement section; the information is presented graphically in Figure PR-1. Runway 01/19 is 2,970 feet long, and 50 feet wide, with an estimated last construction date of 1980. Taxiway 1 also has an estimated last construction date of 1980. Apron 1 (Sections 1, 2, and 3) has a last construction date of 1991. An Inventory Report showing all last construction dates is provided in Appendix PR-2.

The pavement was divided into branches, sections and sample units in accordance with the methodology outlined in Federal Aviation Administration Advisory Circular AC:150/5380-6, *Guidelines and Procedures for Maintenance of Airport Pavements*. The branches, sections and sample units used throughout this project are shown in Figure PR-2. A list report showing all branches and associated information is provided in Appendix PR-1.

Using the branch, section, and sample unit divisions, a visual inspection was conducted at the airport on 25 April 1995. Based on the visual inspection, a Pavement Condition Index (PCI) and Pavement Condition Rating (PCR) were assigned to each pavement section. The PCR for each pavement section is illustrated in Figure PR-3 and its distribution is shown in Figure PR-4. The section PCIs ranged from a low of 23, with a PCR of "Very Poor", to a high of 75, corresponding to a PCR of "Very Good". The average airport PCI was 48, with an associated PCR of "Fair". Summary PCI Reports are provided in Appendices PR-3 and PR-4. The PCI survey data are provided in the Inspection Report attached in Appendix PR-5. The types of distress observed in each pavement section are provided in the Inspection Report. The most common distresses observed throughout the airport were: alligator cracking, longitudinal/transverse cracking, oil spillage, depressions, and weathering/raveling, with isolated occurrences of block cracking, patching and rutting.

RECOMMENDATIONS

A Network Maintenance report was generated using the Micro PAVER pavement maintenance management software. This report indicates, for each pavement section, the recommended localized preventative maintenance activities required to minimize the impact of the existing distresses. This report is provided in Appendix PR-6. This report identified approximately 10,400 lineal feet of cracks needing sealing, approximately 5,800 square feet of pavement requiring a localized sand slurry seal, approximately 155,400 square feet of pavement requiring a localized fog seal, and approximately 5,000 square feet of area requiring an asphalt concrete patch. These activities, if accomplished, will improve the overall pavement condition and will slow its subsequent rate of deterioration.

The Micro PAVER database was also used to develop recommendations for the timing of *global* (applied over the entire pavement section) pavement maintenance activities such as fog seals, sand slurry seals, and bituminous surface treatments, as well as the timing of major rehabilitation projects such as thin (minimum 2-inch thickness) asphalt concrete overlays. The Idaho-specific pavement deterioration curves developed during this project were used to estimate deterioration rates to trigger global maintenance and rehabilitation activities. Based on this analysis the following activities are recommended:

1. Place a thin overlay on Runway 01/19 (Sections 1 and 2) in 1996 to correct the load-related alligator cracking and rutting and to raise the projected PCIs from 34 and 26 (PCRs of "Poor" and "Poor") to 100 (a PCR of "Excellent").
2. Reconstruct Taxiway 01 in 1996 to raise the PCI from a projected 22 (a PCR of "Very Poor") to 100 (a PCR of "Excellent").
3. Place a slurry seal on Apron 1 (Sections 1, 2, and 3) in 1997 to correct environmental distresses and slow pavement deterioration. Patch localized areas of alligator cracking in the apron prior to placing the slurry seal. Monitor the apron for further deterioration.

Undertaking global maintenance on one or more pavement sections as detailed above would eliminate the need for localized fog seals or slurry seals on those sections. However, it is recommended that crack sealing and patching be done prior to global maintenance work to ensure the best possible performance from a seal coat or overlay.

Localized preventative maintenance such as crack sealing should be continued on a regular basis. Such maintenance increases pavement life, and the length of time until major repair or rehabilitation is required.

PAVEMENT CONDITION INDEX

IDAHO STATE AVIATION SYSTEM PLAN

PAVEMENT HISTORY REPORT

Airport Name: Priest River Airport

Date Prepared: 16-Jun-95

Feature No.	Soil Class	Subgrade Class	CBR	Subgrade Prep.	Frost Course	Subbase Course	Base Course	Surface Course	Overlay Course	Surface Treatment	Crack Seal
	Project Number			Date							
R01PR	Silty	Sand					6"	0.2' A.C.			
1	Unknown			1975			0.75" Minus	Plant Mix			
R01PR										P-626	
1	Unknown			Unknown						Slurry	
R01PR	Silty	Sand					6"	0.2' A.C.			
2	Unknown			1975			0.75" Minus	Plant Mix			
R01PR										P-626	
2	Unknown			Unknown						Slurry	
T01PR	Silty	Sand					6"	0.2' A.C.			
	Unknown			1975			0.75" Minus	Plant Mix			
T01PR										P-626	
	Unknown			Unknown						Slurry	
A01PR	Silty	Sand					6"	0.2' A.C.			
1	Unknown			1975			0.75" Minus	Plant Mix			
A01PR										P-626	
1	Unknown			Unknown						Slurry	
A01PR									1.5" A.C.		
1				Nov-91							
A01PR	Silty	Sand					6"	0.2' A.C.			
2	Unknown			1975			0.75" Minus	Plant Mix			
A01PR									1.5" A.C.		
2				Nov-91							
A01PR								A.C.			
3				Unknown							
A01PR									1.5" A.C.		
3				Nov-91							

Figure PR-1. Pavement Cross-Section
Priest River Airport

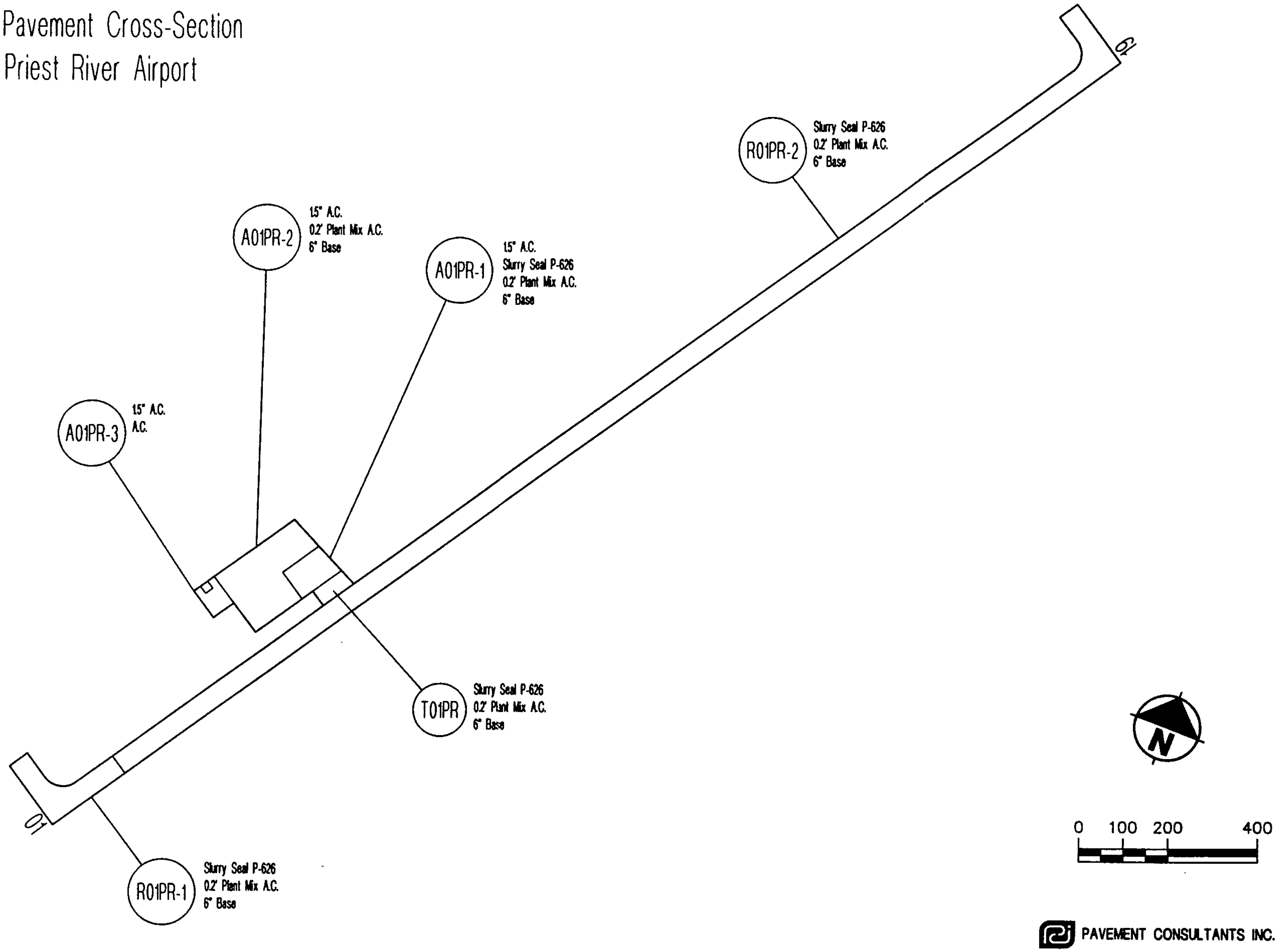


Figure PR-2. Section and Sample Unit Layout
Priest River Airport

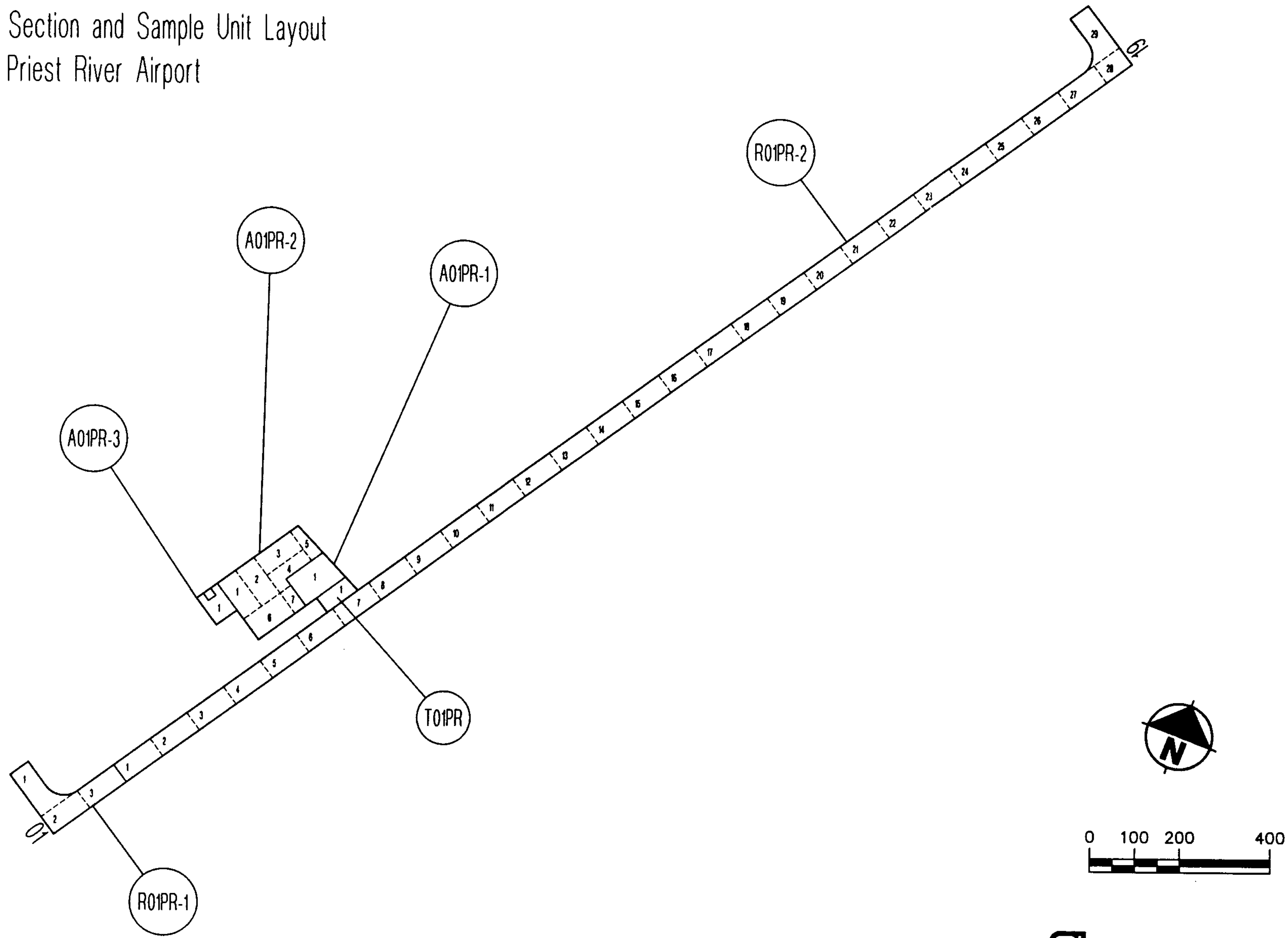


Figure PR-3. Pavement Condition Rating
Priest River Airport

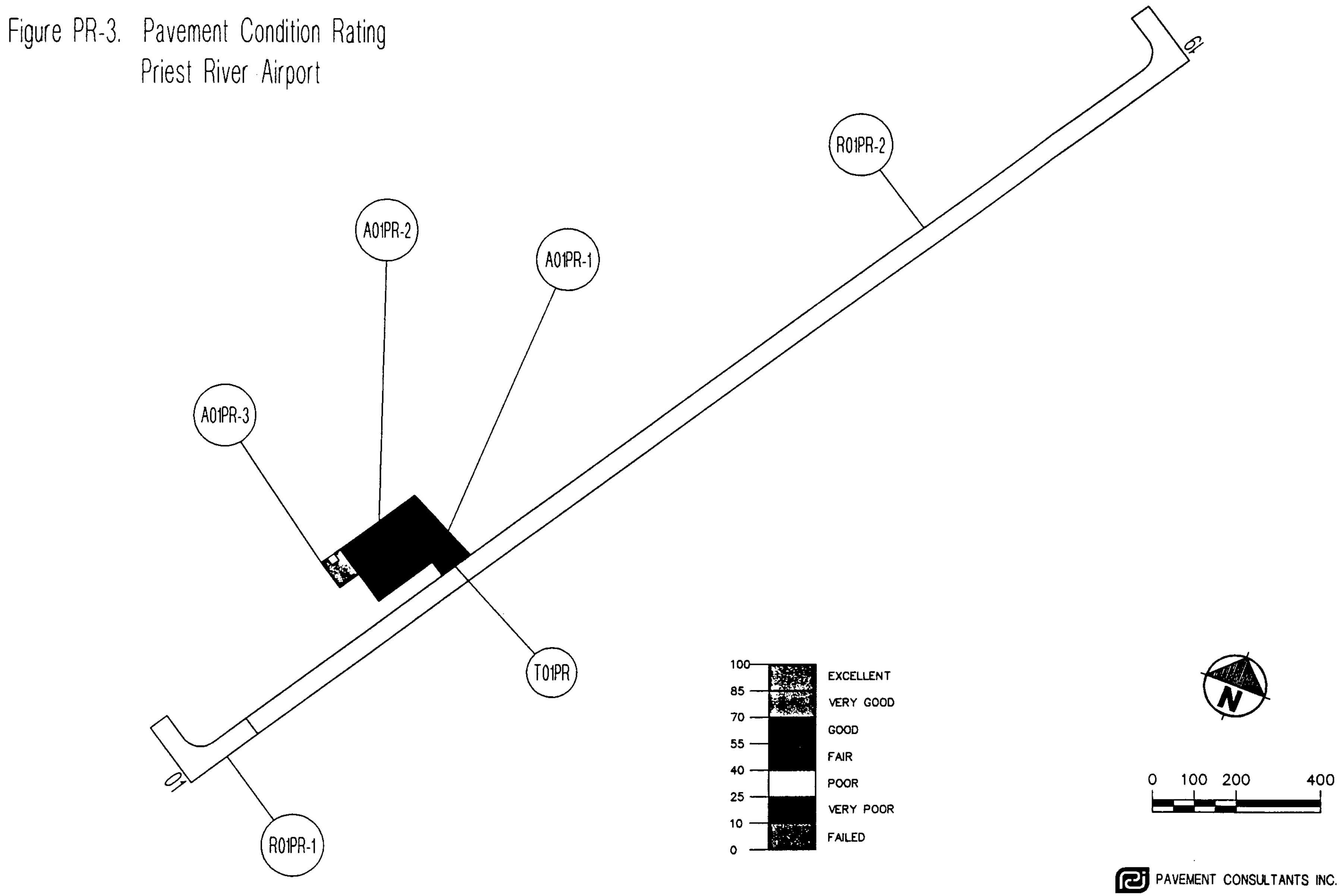
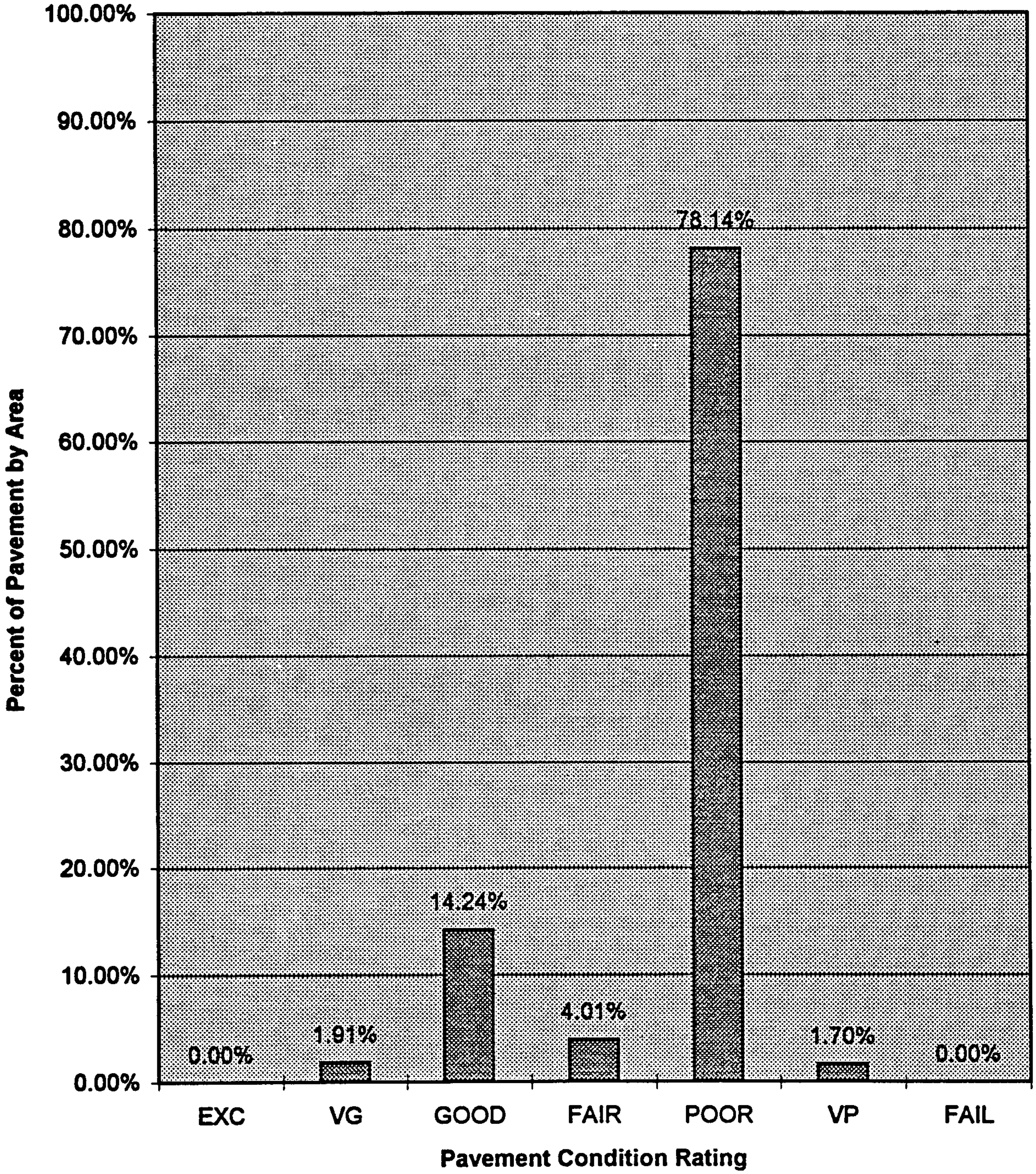


Figure PR-4. Distribution of Pavement Condition Priest River Airport



APPENDIX PR-1

LIST REPORT

BRANCH LISTING REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID: All
Branch Number: All
Branch Use: All
Number of Sections: All
Branch Area: All

Network	Branch Number	Branch Name	Branch Use	Branch Area (SF)	Number of Sections
00031	A01PR	Apron 01	APRON	40086.00	3
00031	R01PR	Runway 01/19	RUNWAY	155434.00	2
00031	T01PR	Taxiway 01	TAXIWAY	3387.00	1
			TOTALS	198907.00	6

APPENDIX PR-2

INVENTORY REPORT

INVENTORY REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR
Report Date: JUN/21/1995

Network ID: All
Branch Number: All
Section Number: All
Branch Use: All
Surface Type: All
Pavement Rank: All
Zone: All
Section Category: All
Section Area: All

	[---Branch---]		[---Section---]							
Network	Num	Use	Num	Cat	Family	Zone	Rank	Type	Length(LF)	Area(SF)
00031	A01PR	APRON	01	1	DEFAULT	1S6	P	AAC	110.00	7971.00
		FROM: T01					TO: A01-2			
			02	1	DEFAULT	1S6	P	AAC	230.00	28315.00
		FROM: A01-1					TO: Hangars			
			03	1	DEFAULT	1S6	S	AAC	75.00	3800.00
		FROM:					TO:			
Apron 01					AREA OF SELECTED SECTIONS:					40086.00
00031	R01PR	RUNWAY	01	1	DEFAULT	1S6	P	AC	200.00	16037.00
		FROM: R01 end					TO: R01-2			
			02	1	DEFAULT	1S6	P	AC	2770.00	139397.00
		FROM: R01-1					TO: R19 end			
Runway 01/19					AREA OF SELECTED SECTIONS:					155434.00
00031	T01PR	TAXIWAY	01	1	DEFAULT	1S6	P	AC	85.00	3387.00
		FROM: R01					TO: A01			
Taxiway 01					AREA OF SELECTED SECTIONS:					3387.00

TOTAL LENGTH : 3470.00 LF TOTAL AREA : 198907.00 SF

APPENDIX PR-3

PCI REPORT - SORTED BY BRANCH AND SECTION

PCI REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID: All
Branch Number: All
Section Number: All
Branch Use: All
Surface Type: All
Pavement Rank: All
Zone: All
Section Category: All
Section Area: All
Last Construction Date: All
Last Inspection Date: All
PCI: All

Netwrk ID	Branch Number Name Use	Section Num/Rank/Surf/Length(LF)/Area(SF)	Last Construct Date	Last Inspection Date	PCI
00031	A01PR Apron 01 APRON	01 / P / AAC / 110.00/ 7971.00 Cat:1 Zone:1S6 From: T01	NOV/01/1991 Family:DEFAULT To: A01-2	APR/25/1995 Age (Yrs): 3.5	55
00031	A01PR Apron 01 APRON	02 / P / AAC / 230.00/ 28315.00 Cat:1 Zone:1S6 From: A01-1	NOV/01/1991 Family:DEFAULT To: Hangars	APR/25/1995 Age (Yrs): 3.5	70
00031	A01PR Apron 01 APRON	03 / S / AAC / 75.00/ 3800.00 Cat:1 Zone:1S6 From:	NOV/01/1991 Family:DEFAULT To:	APR/25/1995 Age (Yrs): 3.5	75
00031	R01PR Runway 01/19 RUNWAY	01 / P / AC / 200.00/ 16037.00 Cat:1 Zone:1S6 From: R01 end	SEP/01/1980 Family:DEFAULT To: R01-2	APR/25/1995 Age (Yrs):14.6	36
00031	R01PR Runway 01/19 RUNWAY	02 / P / AC / 2770.00/ 139397.00 Cat:1 Zone:1S6 From: R01-1	SEP/01/1980 Family:DEFAULT To: R19 end	APR/25/1995 Age (Yrs):14.6	27
00031	T01PR Taxiway 01 TAXIWAY	01 / P / AC / 85.00/ 3387.00 Cat:1 Zone:1S6 From: R01	SEP/01/1980 Family:DEFAULT To: A01	APR/25/1995 Age (Yrs):14.6	23

APPENDIX PR-4

PCI REPORT - SORTED BY PCI

PCI REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID: All
Branch Number: All
Section Number: All
Branch Use: All
Surface Type: All
Pavement Rank: All
Zone: All
Section Category: All
Section Area: All
Last Construction Date: All
Last Inspection Date: All
PCI: All

Netwrk ID	Branch Number / Name / Use	Section Num/Rank/Surf/Length(LF)/Area(SF)	Last Construct Date	Last Inspection Date	PCI
00031	A01PR	03 / S / AAC / 75.00/ 3800.00	NOV/01/1991	APR/25/1995	75
	Apron 01	Cat:1 Zone:1S6	Family:DEFAULT	Age (Yrs): 3.5	
	APRON	From:	To:		
00031	A01PR	02 / P / AAC / 230.00/ 28315.00	NOV/01/1991	APR/25/1995	70
	Apron 01	Cat:1 Zone:1S6	Family:DEFAULT	Age (Yrs): 3.5	
	APRON	From: A01-1	To: Hangars		
00031	A01PR	01 / P / AAC / 110.00/ 7971.00	NOV/01/1991	APR/25/1995	55
	Apron 01	Cat:1 Zone:1S6	Family:DEFAULT	Age (Yrs): 3.5	
	APRON	From: T01	To: A01-2		
00031	R01PR	01 / P / AC / 200.00/ 16037.00	SEP/01/1980	APR/25/1995	36
	Runway 01/19	Cat:1 Zone:1S6	Family:DEFAULT	Age (Yrs):14.6	
	RUNWAY	From: R01 end	To: R01-2		
00031	R01PR	02 / P / AC / 2770.00/ 139397.00	SEP/01/1980	APR/25/1995	27
	Runway 01/19	Cat:1 Zone:1S6	Family:DEFAULT	Age (Yrs):14.6	
	RUNWAY	From: R01-1	To: R19 end		
00031	T01PR	01 / P / AC / 85.00/ 3387.00	SEP/01/1980	APR/25/1995	23
	Taxiway 01	Cat:1 Zone:1S6	Family:DEFAULT	Age (Yrs):14.6	
	TAXIWAY	From: R01	To: A01		

APPENDIX PR-5

INSPECTION REPORT

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

==

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 01 Family - DEFAULT

Section Length - 110.00 LF
Section Width - 75.00 LF
Section Area - 7971.00 SF

==

Inspection Date: APR/25/1995 Safety: Drainage Cond.:
Riding Quality : F.O.D.:
Shoulder Cond. : Overall Cond.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 7971.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	MEDIUM	40.00 (SF)	.50	22.9
45 DEPRESSION	LOW	100.00 (SF)	1.25	8.0
45 DEPRESSION	HIGH	4.00 (SF)	.05	12.0
48 L & T CR	LOW	15.00 (LF)	.19	3.0
48 L & T CR	MEDIUM	134.00 (LF)	1.68	14.4
49 OIL SPILLAGE	N/A	48.00 (SF)	.60	3.2
52 WEATH/RAVEL	LOW	6.00 (SF)	.08	1.0

SAMPLE PCI = 55

RATING = FAIR

PCI OF SECTION = 55

TOTAL NUMBER OF SAMPLE UNITS = 1
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 1
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMEND EVERY SAMPLE UNIT BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = .0%

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	MEDIUM	40.00 (SF)	.50	22.9
45 DEPRESSION	LOW	100.00 (SF)	1.25	8.0
45 DEPRESSION	HIGH	4.00 (SF)	.05	12.0
48 L & T CR	LOW	15.00 (LF)	.19	3.0
48 L & T CR	MEDIUM	134.00 (LF)	1.68	14.4
49 OIL SPILLAGE	N/A	48.00 (SF)	.60	3.2
52 WEATH/RAVEL	LOW	6.00 (SF)	.08	1.0

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = 35.51 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 28.54 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = 35.95 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 02 Family - DEFAULT

Section Length - 230.00 LF
Section Width - 157.00 LF
Section Area - 28315.00 SF

Inspection Date: APR/25/1995 Safety: Drainage Cond.:
Riding Quality : F.O.D.:
Shoulder Cond. : Overall Cond.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
45 DEPRESSION	MEDIUM	100.00 (SF)	2.00	21.8
45 DEPRESSION	HIGH	6.00 (SF)	.12	12.8
48 L & T CR	LOW	126.00 (LF)	2.52	8.8
48 L & T CR	MEDIUM	50.00 (LF)	1.00	11.2
49 OIL SPILLAGE	N/A	30.00 (SF)	.60	3.2

SAMPLE PCI = 60

SAMPLE UNIT=2 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
45 DEPRESSION	MEDIUM	30.00 (SF)	.60	11.8
45 DEPRESSION	HIGH	3.00 (SF)	.06	12.0
48 L & T CR	LOW	146.00 (LF)	2.92	9.8
49 OIL SPILLAGE	N/A	20.00 (SF)	.40	3.0

SAMPLE PCI = 75

SAMPLE UNIT=3 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	94.00 (LF)	1.88	7.1
48 L & T CR	MEDIUM	90.00 (LF)	1.80	14.9
49 OIL SPILLAGE	N/A	10.00 (SF)	.20	2.5

SAMPLE PCI = 78

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

SAMPLE UNIT=6 (RANDOM) SAMPLE SIZE= 5700.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	100.00 (LF)	1.75	6.8
48 L & T CR	MEDIUM	20.00 (LF)	.35	7.0
49 OIL SPILLAGE	N/A	4.00 (SF)	.07	2.0
55 SLIPPAGE CR	N/A	100.00 (SF)	1.75	17.9

SAMPLE PCI = 70

PCI OF SECTION = 70 RATING = GOOD

TOTAL NUMBER OF SAMPLE UNITS = 7
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 4
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMENDED MINIMUM OF 6 RANDOM SAMPLE UNITS TO BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 7.9%

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
45 DEPRESSION	MEDIUM	177.82 (SF)	.63	12.1
45 DEPRESSION	HIGH	12.31 (SF)	.04	12.0
48 L & T CR	LOW	637.43 (LF)	2.25	8.1
48 L & T CR	MEDIUM	218.86 (LF)	.77	10.0
49 OIL SPILLAGE	N/A	87.54 (SF)	.31	2.9
55 SLIPPAGE CR	N/A	136.79 (SF)	.48	7.3

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = .00 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 34.59 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = 65.41 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Inspection Date: AUG/20/1986
Riding Quality :
Shoulder Cond. :
Safety:
Overall Cond.:
Drainage Cond.:
F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	78.00 (SF)	1.56	24.7
43 BLOCK CR	LOW	36.00 (SF)	.72	7.0
43 BLOCK CR	MEDIUM	450.00 (SF)	9.00	22.7
45 DEPRESSION	LOW	589.00 (SF)	11.78	28.9
48 L & T CR	LOW	283.00 (LF)	5.66	16.1
49 OIL SPILLAGE	N/A	3.00 (SF)	.06	2.0
50 PATCHING	LOW	350.00 (SF)	7.00	12.0
52 WEATH/RAVEL	MEDIUM	24.00 (SF)	.48	6.1

SAMPLE PCI = 39

SAMPLE UNIT=2 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	160.00 (SF)	3.20	31.7
43 BLOCK CR	LOW	80.00 (SF)	1.60	9.3
45 DEPRESSION	LOW	171.00 (SF)	3.42	15.7
48 L & T CR	LOW	592.00 (LF)	11.84	25.6
49 OIL SPILLAGE	N/A	11.00 (SF)	.22	2.6
50 PATCHING	LOW	500.00 (SF)	10.00	14.6
52 WEATH/RAVEL	LOW	940.00 (SF)	18.80	13.3

SAMPLE PCI = 41

SAMPLE UNIT=3 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	174.00 (SF)	3.48	32.6
45 DEPRESSION	LOW	227.00 (SF)	4.54	18.4
48 L & T CR	LOW	514.00 (LF)	10.28	23.6
50 PATCHING	LOW	1000.00 (SF)	20.00	20.4
52 WEATH/RAVEL	LOW	1010.00 (SF)	20.20	13.8

SAMPLE PCI = 43

PCI OF SECTION = 41 RATING = FAIR

TOTAL NUMBER OF SAMPLE UNITS = 7
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 3
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMENDED MINIMUM OF 5 RANDOM SAMPLE UNITS TO BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 2.0%

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics Report Date: JUN/21/1995
Database Name : C:PRIESTR

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	777.72 (SF)	2.75	30.2
43 BLOCK CR	LOW	218.97 (SF)	.77	7.2
43 BLOCK CR	MEDIUM	849.45 (SF)	3.00	16.3
45 DEPRESSION	LOW	1863.13 (SF)	6.58	22.2
48 L & T CR	LOW	2621.97 (LF)	9.26	22.2
49 OIL SPILLAGE	N/A	26.43 (SF)	.09	2.0
50 PATCHING	LOW	3492.18 (SF)	12.33	16.2
52 WEATH/RAVEL	LOW	3680.95 (SF)	13.00	11.2
52 WEATH/RAVEL	MEDIUM	45.30 (SF)	.16	4.4

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD	RELATED DISTRESSES =	22.90 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY	RELATED DISTRESSES =	58.77 PERCENT DEDUCT VALUES.
OTHER	RELATED DISTRESSES =	18.33 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

==

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 03 Family - DEFAULT

Section Length - 75.00 LF
Section Width - 56.00 LF
Section Area - 3800.00 SF

==

Inspection Date: APR/25/1995
Riding Quality : Safety: Drainage Cond.:
Shoulder Cond. : Overall Cond.: F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 3800.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	50.00 (LF)	1.32	5.7
48 L & T CR	MEDIUM	85.00 (LF)	2.24	16.7
49 OIL SPILLAGE	N/A	40.00 (SF)	1.05	3.7

SAMPLE PCI = 75

PCI OF SECTION = 75 RATING = V. GOOD

TOTAL NUMBER OF SAMPLE UNITS = 1
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 1
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMEND EVERY SAMPLE UNIT BE SURVEYED.

STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = .0%

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	50.00 (LF)	1.32	5.7
48 L & T CR	MEDIUM	85.00 (LF)	2.24	16.7
49 OIL SPILLAGE	N/A	40.00 (SF)	1.05	3.7

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = .00 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 85.88 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = 14.12 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

Network ID - 00031
Branch Name - Runway 01/19
Branch Number - R01PR
Section Number - 01 Family - DEFAULT

Section Length - 200.00 LF
Section Width - 48.00 LF
Section Area - 16037.00 SF

Inspection Date: APR/25/1995
Riding Quality :
Shoulder Cond. :
Safety:
Overall Cond.:
Drainage Cond.:
F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 6437.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	500.00 (SF)	7.77	40.6
41 ALLIGATOR CR	MEDIUM	500.00 (SF)	7.77	52.9
45 DEPRESSION	LOW	20.00 (SF)	.31	1.7
48 L & T CR	LOW	200.00 (LF)	3.11	10.3
48 L & T CR	MEDIUM	96.00 (LF)	1.49	13.6
52 WEATH/RAVEL	MEDIUM	6437.00 (SF)	100.00	56.8

SAMPLE PCI = 9

SAMPLE UNIT=2 (RANDOM) SAMPLE SIZE= 4800.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	120.00 (SF)	2.50	29.3
41 ALLIGATOR CR	MEDIUM	2.00 (SF)	.04	10.0
48 L & T CR	LOW	167.00 (LF)	3.48	11.3
48 L & T CR	MEDIUM	150.00 (LF)	3.13	19.9
52 WEATH/RAVEL	LOW	4800.00 (SF)	100.00	26.4

SAMPLE PCI = 46

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

SAMPLE UNIT=3 (RANDOM) SAMPLE SIZE= 4800.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	MEDIUM	2.00 (SF)	.04	10.0
48 L & T CR	LOW	100.00 (LF)	2.08	7.6
48 L & T CR	MEDIUM	100.00 (LF)	2.08	16.0
48 L & T CR	HIGH	30.00 (LF)	.63	15.9
52 WEATH/RAVEL	LOW	4800.00 (SF)	100.00	26.4

SAMPLE PCI = 54

PCI OF SECTION = 36 RATING = POOR

TOTAL NUMBER OF SAMPLE UNITS = 3
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 3
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMEND EVERY SAMPLE UNIT BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 24.0%

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	620.00 (SF)	3.87	33.6
41 ALLIGATOR CR	MEDIUM	504.00 (SF)	3.14	41.5
45 DEPRESSION	LOW	20.00 (SF)	.12	.3
48 L & T CR	LOW	467.00 (LF)	2.91	9.8
48 L & T CR	MEDIUM	346.00 (LF)	2.16	16.3
48 L & T CR	HIGH	30.00 (LF)	.19	10.0
52 WEATH/RAVEL	LOW	9600.00 (SF)	59.86	21.7
52 WEATH/RAVEL	MEDIUM	6437.00 (SF)	40.14	38.3

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = 43.77 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 56.04 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = .19 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

Network ID - 00031
Branch Name - Runway 01/19
Branch Number - R01PR
Section Number - 02 Family - DEFAULT

Section Length - 2770.00 LF
Section Width - 48.00 LF
Section Area - 139397.00 SF

Inspection Date: APR/25/1995
Riding Quality : Safety: Drainage Cond.:
Shoulder Cond. : Overall Cond.: F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 4800.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	MEDIUM	75.00 (SF)	1.56	33.7
48 L & T CR	LOW	200.00 (LF)	4.17	12.9
48 L & T CR	MEDIUM	175.00 (LF)	3.65	21.7
48 L & T CR	HIGH	80.00 (LF)	1.67	24.9
52 WEATH/RAVEL	LOW	4800.00 (SF)	100.00	26.4

SAMPLE PCI = 39

SAMPLE UNIT=6 (RANDOM) SAMPLE SIZE= 4800.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	220.00 (SF)	4.58	35.3
41 ALLIGATOR CR	MEDIUM	254.00 (SF)	5.29	47.9
41 ALLIGATOR CR	HIGH	40.00 (SF)	.83	34.4
45 DEPRESSION	LOW	40.00 (SF)	.83	5.6
48 L & T CR	LOW	40.00 (LF)	.83	4.6
48 L & T CR	MEDIUM	60.00 (LF)	1.25	12.4

SAMPLE UNIT=6 (RANDOM) SAMPLE SIZE= 4800.00 SF
(continued)

DISTRESS TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	HIGH	80.00 (LF)	1.67	24.9
52 WEATH/RAVEL	LOW	4800.00 (SF)	100.00	26.4

SAMPLE PCI = 20

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

SAMPLE UNIT=11 (RANDOM) SAMPLE SIZE= 4800.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	60.00 (SF)	1.25	22.6
41 ALLIGATOR CR	MEDIUM	90.00 (SF)	1.88	35.7
48 L & T CR	LOW	75.00 (LF)	1.56	6.3
48 L & T CR	MEDIUM	75.00 (LF)	1.56	13.9
48 L & T CR	HIGH	75.00 (LF)	1.56	24.2
52 WEATH/RAVEL	LOW	4800.00 (SF)	100.00	26.4
53 RUTTING	LOW	100.00 (SF)	2.08	18.7

SAMPLE PCI = 30

SAMPLE UNIT=16 (RANDOM) SAMPLE SIZE= 4800.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	95.00 (SF)	1.98	27.0
41 ALLIGATOR CR	MEDIUM	40.00 (SF)	.83	27.4
48 L & T CR	LOW	272.00 (LF)	5.67	16.1
48 L & T CR	MEDIUM	70.00 (LF)	1.46	13.4
48 L & T CR	HIGH	100.00 (LF)	2.08	27.7
52 WEATH/RAVEL	LOW	4800.00 (SF)	100.00	26.4
53 RUTTING	LOW	150.00 (SF)	3.13	20.9

SAMPLE PCI = 26

SAMPLE UNIT=21 (RANDOM) SAMPLE SIZE= 4800.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	515.00 (SF)	10.73	44.0
48 L & T CR	LOW	80.00 (LF)	1.67	6.5
48 L & T CR	HIGH	40.00 (LF)	.83	18.0
52 WEATH/RAVEL	LOW	4800.00 (SF)	100.00	26.4
53 RUTTING	MEDIUM	100.00 (SF)	2.08	29.4
53 RUTTING	HIGH	150.00 (SF)	3.13	45.3

SAMPLE PCI = 20

PCI OF SECTION = 27 RATING = POOR

TOTAL NUMBER OF SAMPLE UNITS = 29
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 5
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMENDED MINIMUM OF 12 RANDOM SAMPLE UNITS TO BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 7.9%

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	LOW	5169.31 (SF)	3.71	33.2
41 ALLIGATOR CR	MEDIUM	2665.97 (SF)	1.91	35.9
41 ALLIGATOR CR	HIGH	232.33 (SF)	.17	20.9
45 DEPRESSION	LOW	232.33 (SF)	.17	.5
48 L & T CR	LOW	3874.07 (LF)	2.78	9.5
48 L & T CR	MEDIUM	2207.12 (LF)	1.58	14.0
48 L & T CR	HIGH	2178.08 (LF)	1.56	24.2
52 WEATH/RAVEL	LOW	139397.00 (SF)	100.00	26.4
53 RUTTING	LOW	1452.05 (SF)	1.04	15.5
53 RUTTING	MEDIUM	580.82 (SF)	.42	19.1
53 RUTTING	HIGH	871.23 (SF)	.63	30.3

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = 67.51 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 32.25 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = .23 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Inspection Date: AUG/20/1986
Riding Quality : Safety: Drainage Cond.:
Shoulder Cond. : Overall Cond.: F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	146.00 (LF)	2.92	9.8
48 L & T CR	MEDIUM	101.00 (LF)	2.02	15.8

SAMPLE PCI = 79

SAMPLE UNIT=7 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	225.00 (LF)	4.50	13.7
48 L & T CR	MEDIUM	65.00 (LF)	1.30	12.7

SAMPLE PCI = 81

SAMPLE UNIT=13 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	167.00 (LF)	3.34	10.9
48 L & T CR	MEDIUM	65.00 (LF)	1.30	12.7

SAMPLE PCI = 82

SAMPLE UNIT=19 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	352.00 (LF)	7.04	18.7
48 L & T CR	MEDIUM	73.00 (LF)	1.46	13.4

SAMPLE PCI = 76

SAMPLE UNIT=25 (RANDOM) SAMPLE SIZE= 5000.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	190.00 (LF)	3.80	12.0

SAMPLE PCI = 87

PCI OF SECTION = 81 RATING = V. GOOD

TOTAL NUMBER OF SAMPLE UNITS = 29
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 5
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR
Report Date: JUN/21/1995

FOR PROJECT LEVEL ANALYSIS:
RECOMMENDED MINIMUM OF 5 RANDOM SAMPLE UNITS TO BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 4.0%

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
48 L & T CR	LOW	6021.95 (LF)	4.32	13.3
48 L & T CR	MEDIUM	1695.07 (LF)	1.22	12.3

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD RELATED DISTRESSES = .00 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
OTHER RELATED DISTRESSES = .00 PERCENT DEDUCT VALUES.

APPENDIX PR-6

NETWORK MAINTENANCE REPORT

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

*** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	MEDIUM	340.00 (SF)	10.04	56.3
45 DEPRESSION	LOW	60.00 (SF)	1.77	10.4
45 DEPRESSION	HIGH	15.00 (SF)	.44	20.1
48 L & T CR	LOW	12.00 (LF)	.35	3.8
48 L & T CR	MEDIUM	124.00 (LF)	3.66	21.7
52 WEATH/RAVEL	HIGH	15.00 (SF)	.44	10.3

*** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

LOAD	RELATED DISTRESSES =	45.94 PERCENT DEDUCT VALUES.
CLIMATE/DURABILITY	RELATED DISTRESSES =	29.20 PERCENT DEDUCT VALUES.
OTHER	RELATED DISTRESSES =	24.85 PERCENT DEDUCT VALUES.

INSPECTION REPORT

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Surface Type : All
Pavement Rank : All
Zone : All
Section Category : All
Section Area : All
Last Construction Date: All
Last Inspection Date : All

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Network ID - 00031
Branch Name - Taxiway 01
Branch Number - T01PR
Section Number - 01 Family - DEFAULT

Section Length - 85.00 LF
Section Width - 41.00 LF
Section Area - 3387.00 SF

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Inspection Date: APR/25/1995
Riding Quality : Safety: Drainage Cond.:
Shoulder Cond. : Overall Cond.: F.O.D.:

SAMPLE UNIT=1 (RANDOM) SAMPLE SIZE= 3387.00 SF

DISTRESS-TYPE	SEVERITY	QUANTITY	DENSITY %	DEDUCT VALUE
41 ALLIGATOR CR	MEDIUM	340.00 (SF)	10.04	56.3
45 DEPRESSION	LOW	60.00 (SF)	1.77	10.4
45 DEPRESSION	HIGH	15.00 (SF)	.44	20.1
48 L & T CR	LOW	12.00 (LF)	.35	3.8
48 L & T CR	MEDIUM	124.00 (LF)	3.66	21.7
52 WEATH/RAVEL	HIGH	15.00 (SF)	.44	10.3

SAMPLE PCI = 23

PCI OF SECTION = 23 RATING = V. POOR

TOTAL NUMBER OF SAMPLE UNITS = 1
NUMBER OF RANDOM SAMPLE UNITS SURVEYED = 1
NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED = 0

FOR PROJECT LEVEL ANALYSIS:
RECOMMEND EVERY SAMPLE UNIT BE SURVEYED.
STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = .0%

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Work Type Summary Table

Work Type	Netwrk	Branch/ Section	Work-Qty	Cost ($)
Surface Treatment - Loc Fog Se	00031	A01PR 01	6.00 SF	0
	00031	R01PR 01	16037.00 SF	802
	00031	R01PR 02	139397.00 SF	6970
		Total:	155440.00 SF	7772
Surface Treatment - Loc Slurry	00031	R01PR 01	620.00 SF	118
	00031	R01PR 02	5169.31 SF	982
	00031	T01PR 01	15.00 SF	3
		Total:	5804.31 SF	1103

Total cost of all work ($): 32816

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Work Type Summary Table

Work Type	Netwrk	Branch/ Section	Work-Qty	Cost ($)
Patching - AC Deep	00031	A01PR 01	40.00 SF	133
	00031	A01PR 02	136.79 SF	456
	00031	R01PR 01	504.00 SF	1678
	00031	R01PR 02	3769.53 SF	12553
	00031	T01PR 01	340.00 SF	1132
		Total:	4790.32 SF	15952
Patching - AC Leveling	00031	A01PR 01	4.00 SF	0
	00031	A01PR 02	12.31 SF	1
	00031	T01PR 01	15.00 SF	1
		Total:	31.31 SF	2
Do Nothing	00031	A01PR 01	100.00 SF	0
	00031	A01PR 02	177.82 SF	0
	00031	R01PR 01	20.00 SF	0
	00031	R01PR 02	2265.20 SF	0
	00031	T01PR 01	60.00 SF	0
		Total:	2623.02 SF	0
Crack Sealing - AC	00031	A01PR 01	149.00 LF	112
	00031	A01PR 02	856.29 LF	642
	00031	A01PR 03	135.00 LF	102
	00031	R01PR 01	843.00 LF	633
	00031	R01PR 02	8259.28 LF	6195
	00031	T01PR 01	136.00 LF	102
		Total:	10378.57 LF	7786
Patching - AC Deep w/ Coal Tar	00031	A01PR 01	48.00 SF	55
	00031	A01PR 02	87.54 SF	100
	00031	A01PR 03	40.00 SF	46
		Total:	175.54 SF	201

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR
Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Taxiway 01
Branch Number - T01PR
Section Number - 01

Section Length - 85.00 LF
Section Width - 41.00 LF
Section Area - 3387.00 SF

Inspection Date - APR/25/1995
Section PCI - 23

Distress Type	Dis Sev	Dist-Qty Work-Qty	Work Type	Total Cost ($)
41 ALLIGATOR CR	M	340.00 SF		
		340.00 SF	Patching - AC Deep	1132
45 DEPRESSION	H	15.00 SF		
		15.00 SF	Patching - AC Leveling	1
45 DEPRESSION	L	60.00 SF		
		60.00 SF	Do Nothing	0
48 L & T CR	L	12.00 LF		
		12.00 LF	Crack Sealing - AC	9
48 L & T CR	M	124.00 LF		
		124.00 LF	Crack Sealing - AC	93
52 WEATH/RAVEL	H	15.00 SF		
		15.00 SF	Surface Treatment - Loc Slurry	3
			Total	1238

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Runway 01/19
Branch Number - R01PR
Section Number - 02

Section Length - 2770.00 LF
Section Width - 48.00 LF
Section Area - 139397.00 SF

Inspection Date - APR/25/1995

Section PCI - 27

Distress Type	Dis Sev	Dist-Qty Work-Qty	Work Type	Total Cost ($)
41 ALLIGATOR CR	H	232.33 SF		
		232.33 SF	Patching - AC Deep	774
41 ALLIGATOR CR	L	5169.31 SF		
		5169.31 SF	Surface Treatment - Loc Slurry	982
41 ALLIGATOR CR	M	2665.97 SF		
		2665.97 SF	Patching - AC Deep	8878
45 DEPRESSION	L	232.33 SF		
		232.33 SF	Do Nothing	0
48 L & T CR	H	2178.08 LF		
		2178.08 LF	Crack Sealing - AC	1634
48 L & T CR	L	3874.07 LF		
		3874.07 LF	Crack Sealing - AC	2906
48 L & T CR	M	2207.12 LF		
		2207.12 LF	Crack Sealing - AC	1655
52 WEATH/RAVEL	L	139397.00 SF		
		139397.00 SF	Surface Treatment - Loc Fog Se	6970
53 RUTTING	H	871.23 SF		
		871.23 SF	Patching - AC Deep	2901
53 RUTTING	L	1452.05 SF		
		1452.05 SF	Do Nothing	0
53 RUTTING	M	580.82 SF		
		580.82 SF	Do Nothing	0
			Total	26700

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Runway 01/19
Branch Number - R01PR
Section Number - 01

Section Length - 200.00 LF
Section Width - 48.00 LF
Section Area - 16037.00 SF

Inspection Date - APR/25/1995

Section PCI - 36

Distress Type	Dis Sev	Dist-Qty Work-Qty	Work Type	Total Cost ($)
41 ALLIGATOR CR	L	620.00 SF		
		620.00 SF	Surface Treatment - Loc Slurry	118
41 ALLIGATOR CR	M	504.00 SF		
		504.00 SF	Patching - AC Deep	1678
45 DEPRESSION	L	20.00 SF		
		20.00 SF	Do Nothing	0
48 L & T CR	H	30.00 LF		
		30.00 LF	Crack Sealing - AC	23
48 L & T CR	L	467.00 LF		
		467.00 LF	Crack Sealing - AC	350
48 L & T CR	M	346.00 LF		
		346.00 LF	Crack Sealing - AC	260
52 WEATH/RAVEL	L	9600.00 SF		
		9600.00 SF	Surface Treatment - Loc Fog Se	480
52 WEATH/RAVEL	M	6437.00 SF		
		6437.00 SF	Surface Treatment - Loc Fog Se	322
			Total	3231

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 03

Section Length - 75.00 LF
Section Width - 56.00 LF
Section Area - 3800.00 SF

Inspection Date - APR/25/1995

Section PCI - 75

Distress Type	Dis Sev	Dist-Qty Work-Qty	Work Type	Total Cost ($)
48 L & T CR	L	50.00 LF		
		50.00 LF	Crack Sealing - AC	38
48 L & T CR	M	85.00 LF		
		85.00 LF	Crack Sealing - AC	64
49 OIL SPILLAGE		40.00 SF		
		40.00 SF	Patching - AC Deep w/ Coal Tar	46
			Total	148

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 02

Section Length - 230.00 LF
Section Width - 157.00 LF
Section Area - 28315.00 SF

Inspection Date - APR/25/1995

Section PCI - 70

Distress Type	Dis Sev	Dist-Qty Work-Qty	Work Type	Total Cost ($)
45 DEPRESSION	H	12.31 SF		
		12.31 SF	Patching - AC Leveling	1
45 DEPRESSION	M	177.82 SF		
		177.82 SF	Do Nothing	0
48 L & T CR	L	637.43 LF		
		637.43 LF	Crack Sealing - AC	478
48 L & T CR	M	218.86 LF		
		218.86 LF	Crack Sealing - AC	164
49 OIL SPILLAGE		19.15 SF		
		19.15 SF	Patching - AC Deep w/ Coal Tar	22
49 OIL SPILLAGE		68.39 SF		
		68.39 SF	Patching - AC Deep w/ Coal Tar	78
55 SLIPPAGE CR		136.79 SF		
		136.79 SF	Patching - AC Deep	456
			Total	1199

Network Maintenance Report

Site Name : Idaho Division of Aeronautics
Database Name : C:PRIESTR

Report Date: JUN/21/1995

Network ID : All
Branch Number : All
Section Number : All
Branch Use : All
Pavement Rank : All
Surface Type : All
Zone : All
Section Category : All
Last Construction Date: All
PCI : All

Network ID - 00031
Branch Name - Apron 01
Branch Number - A01PR
Section Number - 01

Inspection Date - APR/25/1995

Section Length - 110.00 LF
Section Width - 75.00 LF
Section Area - 7971.00 SF
Section PCI - 55

Distress Type	Dis Sev	Dist-Qty Work-Qty	Work Type	Total Cost ($)
41 ALLIGATOR CR	M	40.00 SF		
		40.00 SF	Patching - AC Deep	133
45 DEPRESSION	H	4.00 SF		
		4.00 SF	Patching - AC Leveling	0
45 DEPRESSION	L	100.00 SF		
		100.00 SF	Do Nothing	0
48 L & T CR	L	15.00 LF		
		15.00 LF	Crack Sealing - AC	11
48 L & T CR	M	134.00 LF		
		134.00 LF	Crack Sealing - AC	101
49 OIL SPILLAGE		48.00 SF		
		48.00 SF	Patching - AC Deep w/ Coal Tar	55
52 WEATH/RAVEL	L	6.00 SF		
		6.00 SF	Surface Treatment - Loc Fog Se	0
			Total	300

APPENDIX E

Pavement Database Summary

Airport Name	State	R/W ID	Orig Const	Base Year	S-Depth	O/L Depth	Base	B-Depth	Subbase	SB-Depth	Comments
Anacortes Airport	WA	R1	1968	1991	2	2	DBST	0	base	0	Entire runway resurfaced w/2" AC in 1973
Anacortes Airport	WA	R2	1968	1991	2	2	base	3	subbase	0	Entire runway resurfaced w/2" AC in 1973
Anacortes Airport	WA	R3	1968	1991	2	2	base	4	subbase	0	Entire runway resurfaced w/2" AC in 1973
Arlington Municipal Airport	WA	R1	1942	1976	5	2	base	8		0	Main runway. Overlaid 1976 w/2" AC over 3" AC
Arlington Municipal Airport	WA	R2	1942	1991	3		base	6		0	Entire runway was reconstructed using fabric and asphalt
Auburn Municipal Airport	WA	R1	1968	1968	2		base	18		0	
Auburn Municipal Airport	WA	R2	1983	1983	2		base	3	subbase	6	
Blaine Municipal Airport	WA	R1	1972	1992	4	2	base	8		0	Runway overlaid and widened in 1992
Bowerman Field, Hoquiam	WA	R1	1943	1990	5.5	3	base	12		0	Entire runway overlaid w/3" AC in 1990 over 2.5" AC and base
Bowerman Field, Hoquiam	WA	R2	1943	1990	8	3	base	6	subbase	8	Combined into main runway. Originally were PCC ends.
Bowerman Field, Hoquiam	WA	R3	1943	1990	8	3	base	6	subbase	8	Combined into main runway. Originally were PCC ends.
Bowers Field, Ellensburg	WA	R1	1976	1987	3	2	base	6.5		0	2" AC overlay applied to center in 1976
Bowers Field, Ellensburg	WA	R3	1942	1942	2.5		base	6		0	
Bowers Field, Ellensburg	WA	R4	1942	1942	2.5		base	3	subbase	5	
Bremerton National	WA	R1	1942	1974	5.5	3	base	6		0	3" AC overlay applied in 1974

Airport Name	State	R/W ID	PCI #1	Date #1	PCI #2	Date #2	PCI #3	Date #3	Repair #1	Date Rpr 1	Repair #2	Date Rpr 2	Repair #3	Date Rpr 3	Repair #4	Date Rpr 4
Anacortes Airport	WA	R1	96	1986	91	1989	94	1992	Overlay	1973	Slurry seal	1991				
Anacortes Airport	WA	R2	95	1986	90	1989	90	1992	Overlay	1973	Slurry seal	1991				
Anacortes Airport	WA	R3	100	1986	92	1989	100	1992	Overlay	1973	Slurry seal	1991				
Arlington Municipal Airport	WA	R1	77	1986	78	1989	80	1992								
Arlington Municipal Airport	WA	R2	89	1986	84	1989	100	1992	Overlay	1976	Reconstruc	1991				
Auburn Municipal Airport	WA	R1	81	1987	84	1991	0	0								
Auburn Municipal Airport	WA	R2	90	1987	87	1991	0	0								
Blaine Municipal Airport	WA	R1	72	1988	98	1992	0	0	Overlay	1992						
Bowerman Field, Hoquiam	WA	R1	77	1986	84	1989	88	1992	Overlay	1990						
Bowerman Field, Hoquiam	WA	R2	86	1986	84	1989	0	0	Overlay	1990						
Bowerman Field, Hoquiam	WA	R3	33	1986	26	1989	0	0	Overlay	1990						
Bowers Field, Ellensburg	WA	R1	67	1986	64	1989	62	1993	Slurry seal	1987						
Bowers Field, Ellensburg	WA	R3	57	1986	64	1989	53	1993								

Deer Park Airport	WA	R1	45	1986	76	1989	0	0		
Deer Park Airport	WA	R2	72	1986	74	1989	0	0		
Deer Park Airport	WA	R3	47	1986	39	1989	0	0		
Elma Municipal Airport	WA	R1	88	1988	83	1991	0	0		
Ephrata Municipal Airport	WA	R1	40	1987	33	1991	0	0		
Ephrata Municipal Airport	WA	R1A	60	1987	55	1991	0	0	Slurry seal	1970
Ephrata Municipal Airport	WA	R2	53	1987	43	1991	0	0	Slurry seal	1970
Ephrata Municipal Airport	WA	R2A	47	1987	26	1991	0	0		
Ephrata Municipal Airport	WA	R2B	89	1987	84	1991	0	0		
Evergreen Field, Vancouver	WA	R1	55	1987	51	1991	0	0		
Evergreen Field, Vancouver	WA	R2	86	1987	77	1991	0	0		
Ferry County (Republic) Airport	WA	R1	65	1986	70	1991	0	0	Chip seal	1978
Grand Couly Dam Airpot	WA	R1	86	1986	87	1989	0	0	Overlay	1980
Grand Couly Dam Airport	WA	R2	84	1986	85	1989	0	0		

Bremerton National	WA	R1	86	1987	86	1991	0	0	Overlay	1974					
Bremerton National	WA	R2	83	1987	75	1991	0	0	Overlay	1974					
Bremerton National	WA	R3	86	1987	80	1991	0	0							
Bremerton National	WA	R4	88	1987	83	1991	0	0	Overlay	1974					
Bremerton National	WA	R5	82	1987	80	1991	0	0							
Cashmere-Dryden Airport	WA	R1	72	1988	69	1992	0	0	Seal coat	1976	Seal coat	1990	DBST	1984	Seal Coat 199
Chehalis-Centralia Airport	WA	R1	84	1987	81	1991	0	0							
Chehalis-Centralia Airport	WA	R2	78	1987	67	1991	0	0							
Cle Elum Municipal Airport	WA	R1	56	1988	62	1992	0	0							
Colville Municipal Airport	WA	R1	62	1989	52	1993	0	0	Seal coat	1958	TBST	1987			
Concrete Municipal Airport	WA	R1	61	1986	34	1989	24	1992							
Connell City Airport	WA	R1	69	1987	79	1991	0	0	Overlay	1979					
Crest Airport, Kent	WA	R1	97	1987	90	1991	0	0	Overlay	1986					
Davenport Airport	WA	R1	82	1986	60	1989	61	1993	BST	1977	Seal coat	1984	Seal coat	1991	

Bremerton National	WA	R3	1942	1942	5		base	4	subbase	6	
Bremerton National	WA	R4	1942	1974	5	2	base	4	subbase	6	2" AC overlay applied in 1974
Bremerton National	WA	R5	1942	1942	2.5		base	6		0	
Cashmere-Dryden Airport	WA	R1	1951	1990			base	9		0	Seal coated several times. New DBST applied in 1984.
Chehalis-Centralia Airport	WA	R1	1942	1942	8		base	6		0	
Chehalis-Centralia Airport	WA	R2	1942	1942	8		base	6		0	
Cle Elum Municipal Airport	WA	R1	1987	1987			base	4		0	Less loose aggregate than in 1988 survey, so better PCI.
Colville Municipal Airport	WA	R1	1949	1987		2	DBST	0	base	8	400' end of runway overlaid in 1993 w/2" AC
Concrete Municipal Airport	WA	R1	1947	1974			base	2	subbase	4	Very low use.
Connell City Airport	WA	R1	1970	1979	2	2	BST	0		0	2" AC overlay applied over existing BST
Crest Airport, Kent	WA	R1	1967	1986	2	2	BST	0	gravel	0	2" AC overlay applied over existing BST
Davenport Airport	WA	R1	1973	1977			base	8		0	
Deer Park Airport	WA	R1	1943	1943	1.5		base	8		0	Data does not reflect downgrade. No repairs mentioned.
Deer Park Airport	WA	R2	1976	1976	2		base	6		0	Survey results were inconsistent.
Deer Park Airport	WA	R3	1943	1943	1.5		base	6		0	
Elma Municipal Airport	WA	R1	1976	1976	1.5		base	6		0	

Ione Municipal Airport	WA	R1	76	1986	76	1989	70	1992	UNK			
Ione Municipal Airport	WA	R2	80	1989	80	1992	0	0				
Kelso-Longview	WA	R1	90	1987	82	1991	0	0				
Kennewick-Vista Field	WA	R1	69	1987	66	1992	0	0	Chip seal	1976		
Kennewick-Vista Field	WA	R2	68	1987	63	1992	0	0				
Lake Chelan Airport	WA	R1	93	1988	90	1993	0	0	Seal coat	1976		
Lind Airport	WA	R1	51	1987	51	1991	0	0	Slurry seal	1982		
Mansfield Airport	WA	R1	35	1988	27	1993	0	0	Chip seal	1979	Chip seal	1983
Moses Lake Municipal Airport	WA	R1	89	1987	81	1991	0	0	Slurry seal		Overlay	1984
Moses Lake Municipal Airport	WA	R2	29	1987	18	1991	0	0				
New Warden Airport	WA	R1	77	1987	79	1991	0	0				
Oak Harbor Air Park	WA	R1	73	1988	68	1992	0	0	Overlay	1971		
Ocean Shores Airport	WA	R1	98	1986	95	1989	93	1992	Overlay	1987		
Odessa Municipal	WA	R1	79	1987	46	1991	0	0	Reconstruc	1985		

Ephrata Municipal Airport	WA	R1A	1943	1970	3		base	6		0	
Ephrata Municipal Airport	WA	R2	1943	1970	2.5		base	6		0	
Ephrata Municipal Airport	WA	R2A	1943	1943	6		base	6		0	
Ephrata Municipal Airport	WA	R2B	1983	1983	3		base	7	subbase	12	
Evergreen Field, Vancouver	WA	R1	1967	1967	2		base	4		0	
Evergreen Field, Vancouver	WA	R2	1971	1971	2		base	4		0	
Ferry County (Republic) Airport	WA	R1	1974	1978			base	5	subbase	6	
Grand Couly Dam Airpot	WA	R1	1972	1980		2	base	6		0	
Grand Couly Dam Airport	WA	R2	1980	1980	2		base	5		0	
Harvey Field (Snohomish)	WA	R1	1970	1970	2		base	12		0	Very small but active.
Ione Municipal Airport	WA	R1	1973	1973			base	4	subbase	8	
Ione Municipal Airport	WA	R2	0	1989			base	4	subbase	10	Runway extension
Kelso-Longview	WA	R1	1983	1983	3		base	5	subbase	9	
Kennewick-Vista Field	WA	R1	1942	1976	2		base	6		0	
Kennewick-Vista Field	WA	R2	1942	1942	2		base	6		0	
Lake Chelan Airport	WA	R1	0	1986	2		base	5		0	

Odessa Municipal	WA	R2	58	1987	50	1991	0	0	Reconstruc	1985
Okanagan Legion Airport	WA	R1	76	1987	65	1992	0	0	DBST	1987
Olympia Airport	WA	R1	55	1988	45	1991	0	0		
Olympia Airport	WA	R2	89	1988	85	1991	0	0		
Olympia Airport	WA	R3	86	1988	84	1991	0	0	Overlay	1980
Omak Airport	WA	R1	68	1986	65	1989	61	1992	Overlay	1974
Othello Municipal Airport	WA	R1	79	1987	74	1991	0	0	Overlay	1976
Othello Municipal Airport	WA	R2	90	1991	0	0	0	0		
Packwood Airport	WA	R1	94	1988	90	1991	0	0	Overlay	1985
Pangborn Field (Wenatchee)	WA	R1	63	1988	0	0	0	0	Chip seal	1974
Pangborn Field (Wenatchee)	WA	R2	66	1988	0	0	0	0	Chip seal	1974
Pangborn Field (Wenatchee)	WA	R4	55	1988	0	0	0	0		
Pangborn Field (Wenatchee)	WA	R5	90	1988	0	0	0	0		
Pearson Airpark (Vancouver)	WA	R1	58	1987	58	1991	0	0	Chip seal	1975

Mansfield Airport	WA	R1	1973	1983			base	4		0	
Moses Lake Municipal Airport	WA	R1	1961	1984	2	2	DBST	0	base	6	
Moses Lake Municipal Airport	WA	R2	1973	1973	0.75			0		0	
New Warden Airport	WA	R1	1977	1977	2		base	6		0	Survey results are inconsistent.
Oak Harbor Air Park	WA	R1	1969	1971	2	2	base	3	subbase	7	Twin engine commuter airport
Ocean Shores Airport	WA	R1	1985	1987	1	1	DBST	0	base	8	1" AC laid over existing DBST in 1987
Odessa Municipal	WA	R1	1970	1985			base	6		0	
Odessa Municipal	WA	R2	1970	1985			base	3		0	
Okanagan Legion Airport	WA	R1	1955	1987			base	2		0	Low activity airport. Very soft ground in spring.
Olympia Airport	WA	R1	1942	1942	2.5		base	6		0	
Olympia Airport	WA	R2	1980	1980	3		base	10	subbase	6	
Olympia Airport	WA	R3	1942	1980	5.5	3	base	6		0	3" AC overlay applied in 1980
Omak Airport	WA	R1	1943	1974	7	2.5		0	subbase	12	2.5" AC overlay on 4.5" of AC in 1974
Othello Municipal Airport	WA	R1	0	1976	2	2	BST	0	base	3	2" AC overlay over BST
Othello Municipal Airport	WA	R2	0	1991	3		base	6		0	
Packwood Airport	WA	R1	1975	1985	2	2	base	2	BST and gr	0	2" new base and 2" new asphalt applied in 1985

Pierce County (Puyallup)	WA	R1	64	1986	98	1989	91	1992	Reconstruc	1988				
Port of Ilwaco Airport	WA	R1	71	1986	49	1989	36	1992						
Port of Willipa Harbor Airport	WA	R1	72	1986	58	1989	49	1992	Reconstruc	1971				
Port of Willipa Harbor Airport	WA	R2	68	1986	59	1989	46	1992	Reconstruc	1971				
Prosser Airport	WA	R1	88	1987	83	1992	0	0	Reconstruc	1977	Chip seal	1981	Slurry seal	1989
Pru Field (Ritzville)	WA	R1	83	1987	77	1991	0	0	Slurry seal	1985				
Pullman-Moscow Regional Airpo	WA	R1	75	1986	70	1989	0	0	Overlay	1972	Reconstruc	1993		
Pullman-Moscow Regional Airpo	WA	R2	70	1986	48	1989	0	0	Reconstruc	1993				
Pullman-Moscow Regional Airpo	WA	R3	81	1986	68	1989	0	0	Reconstruc	1993				
Quillayute Airport	WA	R1	72	1986	69	1989	0	0						
Quincy Municipal Airport	WA	R1	72	1987	70	1991	0	0	Slurry seal	1980				
Quincy Municipal Airport	WA	R2	31	1987	0	0	0	0						
Richland Airport	WA	R1	86	1987	81	1992	0	0	Overlay	1979				
Richland Airport	WA	R2	94	1987	82	1992	0	0	Overlay	1979				

Pangborn Field (Wenatchee)	WA	R2	1947	1974		AC	3	base	8	BST applied over existing asphalt
Pangborn Field (Wenatchee)	WA	R4	1947	1947	2	base	7		0	
Pangborn Field (Wenatchee)	WA	R5	1978	1978	3	base	6		0	
Pearson Airpark (Vancouver)	WA	R1	1966	1975		AC	1.5		0	BST applied over existing asphalt
Pearson Airpark (Vancouver)	WA	R2	1966	1975		AC	1.5		0	BST applied over existing asphalt
Pierce County (Puyallup)	WA	R1	1958	1988	2	base	4	subbase	6	Very active GA airport
Port of Ilwaco Airport	WA	R1	1971	1971	1.5		0		0	
Port of Willipa Harbor Airport	WA	R1	1948	1971	1	base	3	subbase	5	
Port of Willipa Harbor Airport	WA	R2	1948	1971	1.25	base	3	subbase	7	
Prosser Airport	WA	R1	1977	1989	2	base	6	subbase	1.5	
Pru Field (Ritzville)	WA	R1	1978	1985			0		0	
Pullman-Moscow Regional Airpo	WA	R1	1948	1993	4	base	8	subbase	7	Busy regional air carrier and GA. Totally reconstructed 1993.
Pullman-Moscow Regional Airpo	WA	R2	1968	1993	4	base	8	subbase	7	Busy regional air carrier and GA. Totally reconstructed 1993.
Pullman-Moscow Regional Airpo	WA	R3	1968	1993	4	base	8	subbase	7	Busy regional air carrier and GA. Totally reconstructed 1993.
Quillayute Airport	WA	R1	0	0	6		0		0	
Quincy Municipal Airport	WA	R1	1977	1980		base	3		0	

Richland Airport	WA	R3	96	1987	93	1992	0	0				
Rosalia Municipal Airport	WA	R1	68	1987	49	1991	0	0				
Sand Canyon (Cehwelah) Airpor	WA	R1	88	1986	70	1989	62	1993	Overlay	1979	Slurry seal	1985
Sanderson Field (Shelton)	WA	R1	77	1988	72	1991	0	0	Slurry seal	1979		
Sekiu Airport	WA	R1	68	1988	61	1992	0	0	Chip seal	1987		
Sekiu Airport	WA	R2	88	1988	85	1992	0	0	Chip seal	1987		
Sequim Valley Airport	WA	R1	52	1988	42	1991	0	0				
Skagit Regional Airport	WA	R1	69	1986	0	0	0	0				
Skagit Regional Airport	WA	R2	64	1986	0	0	0	0				
Storm Field (Morton)	WA	R1	73	1988	68	1991	0	0	TBST	1987		
Sunnyside Airport	WA	R1	85	1987	80	1992	0	0	Chip seal	1985		
Tacoma Narrows Airport	WA	R1	84	1987	83	1991	0	0				
Tacoma Narrows Airport	WA	R2	82	1987	81	1991	0	0				
Walla Walla City/County Airport	WA	R1	81	1987	82	1992	0	0	Overlay	1970		

Richland Airport	WA	R1	1943	1979	4	2	base	6		0	2" AC overlay over 2" AC
Richland Airport	WA	R2	1943	1979	4	2	base	8		0	2" AC overlay over 2" AC
Richland Airport	WA	R3	1979	1979	3		base	3	subbase	4	
Rosalia Municipal Airport	WA	R1	1985	1985			base	3	subbase	3.5	
Sand Canyon (Cehwelah) Airpor	WA	R1	1974	1985	1	1	DBST	0	subbase	12	1" AC applied over DBST in 1979
Sanderson Field (Shelton)	WA	R1	1942	1979	2		base	6		0	
Sekiu Airport	WA	R1	1972	1987	2		base	6		0	Very low activity
Sekiu Airport	WA	R2	1979	1987	2		base	6		0	Very low activity
Sequim Valley Airport	WA	R1	1985	1985			base	12		0	
Skagit Regional Airport	WA	R1	1942	1942	2		base	4	subbase	6	
Skagit Regional Airport	WA	R2	1942	1942	2		base	4	subbase	12	
Storm Field (Morton)	WA	R1	1970	1987				0		0	
Sunnyside Airport	WA	R1	1975	1985	3		base	6		0	
Tacoma Narrows Airport	WA	R1	0	0	2.5		base	8	subbase	3	
Tacoma Narrows Airport	WA	R2	0	0	2		base	7	subbase	3	
Walla Walla City/County Airport	WA	R1	1942	1972	1.5	1.5	PCC	6.5	base	6	

Walla Walla City/County Airport	WA	R3	60	1987	48	1992	0	0				
Waterville Airport	WA	R1	65	1989	57	1993	0	0	Slurry seal	1988		
Whitman County Memorial Airpo	WA	R1	57	1986	40	1989	29	1993	Slurry seal	1981		
Wilbur Airport	WA	R1	92	1986	83	1989	75	1993	Seal coat	1983	Overlay	1985
William R. Fairchild Int'l Airport	WA	R1	79	1988	0	0	0	0	Overlay/slur	1979		
William R. Fairchild Int'l Airport	WA	R2	86	1988	0	0	0	0	Overlay/slur	1979		
William R. Fairchild Int'l Airport	WA	R4	94	1988	0	0	0	0	Overlay/slur	1978		
Willard-Tekoa Field	WA	R1	90	1986	90	1989	85	1993	Slurry seal	1987		
Winlock (Toledo) Airport	WA	R1	49	1986	42	1989	36	1992				
Woodland State Airport	WA	R1	91	1987	88	1991	0	0				
Friday Harbor Airport	WA	R1	90	1988	0	0	0	0				
Godendale Airport	WA	R1	87	1989	89	1993	0	0	Slurry seal	1992		
Oroville Airport	WA	R1	79	1987	77	1992	0	0	Chip seal	1992		
[illegible] Airport	WA	R1	73	1988	0	0	0	0				

Walla Walla City/County Airport	WA	R3	1942	1942	6.5		base	6		0	
Waterville Airport	WA	R1	1976	1988			base	6		0	Small with low activity
Whitman County Memorial Airpo	WA	R1	1970	1981			base	6		0	
Wilbur Airport	WA	R1	1971	1985	2	2	DBST	0	base	6	
William R. Fairchild Int'l Airport	WA	R1	1942	1979	4	2	base	6		0	2" AC overlay applied over 2" AC
William R. Fairchild Int'l Airport	WA	R2	1942	1979	4	2	base	6		0	2" AC overlay applied over 2" AC
William R. Fairchild Int'l Airport	WA	R4	1942	1978	4	2	base	6		0	2" AC overlay applied over 2" AC
Willard-Tekoa Field	WA	R1	1975	1987	2		base	4	subbase	12	
Winlock (Toledo) Airport	WA	R1	1943	1943	2		base	8		0	
Woodland State Airport	WA	R1	1984	1984				0		0	
Friday Harbor Airport	WA	R1	0	0	2		base	3	subbase	4	
Godendale Airport	WA	R1	1984	1992			base	12		0	
Oroville Airport	WA	R1	1986	1992			base	6		0	
Wenthrop Airport	WA	R1	0	0	1			0		0	
Albany Municipal Airport	OR	R1	1959	1986	4	2	base	8		0	2" AC overlay over 2" AC
Ashland Municipal Airport	OR	R1	1965	1986	3	2	base	4.5	subbase	3	2" AC overlay over 1" AC

Albany Municipal Airport	OR	R1	99	1988	0	0	0	0	Overlay	1986		
Ashland Municipal Airport	OR	R1	91	1987	89	1991	0	0	Overlay	1986		
Ashland Municipal Airport	OR	R2	92	1987	88	1991	0	0				
Aurora State Airport	OR	R1	85	1986	81	1989	0	0	Overlay	1978		
Baker Municipal Airport	OR	R2	66	1986	0	0	0	0	Seal coat	1963		
Baker Municipal Airport	OR	R3	69	1986	66	1989	0	0	Seal coat	1963		
Baker Municipal Airport	OR	R4	88	1986	82	1989	0	0	Reconstruc	1983	Fog Seal	1984
Bandon State Airport	OR	R1	72	1986	57	1989	0	0	Chip seal	1972		
Bend Municipal Airport	OR	R1	80	1986	79	1989	0	0				
Bend Municipal Airport	OR	R2	89	1986	79	1989	0	0				
Boardman Airport	OR	R1	57	1988	0	0	0	0	Overlay	1980		
Brookings State Airport	OR	R1	90	1986	88	1989	0	0				
Brookings State Airport	OR	R2	90	1986	91	1989	0	0				
Burns Municipal Airport	OR	R1	0		0	0	0	0	Reconstruc	1987		

Aurora State Airport	OR	R1	1975	1978	5	2	base	2	subbase	13	2" AC overlay over 3" AC
Baker Municipal Airport	OR	R2	1942	1942	2.5		base	15		0	R2 was not surveyed
Baker Municipal Airport	OR	R3	1942	1942	2.5		base	15		0	
Baker Municipal Airport	OR	R4	1983	1983	2.5		base	3	subbase	10	Survey identified R4 and R5 separately, but are same structure.
Bandon State Airport	OR	R1	1966	1972	2			0		0	An overlay was scheduled for 1990.
Bend Municipal Airport	OR	R1	1977	1977	2		base	9		0	
Bend Municipal Airport	OR	R2	1977	1984	2		base	6		0	
Boardman Airport	OR	R1	1943	1980	3.5	1.5	base	2	subbase	8	1.5" AC overlay applied over 2" AC
Brookings State Airport	OR	R1	1968	1968	2.5		base	4		0	
Brookings State Airport	OR	R2	1968	1968	1.5		base	4		0	Rated higher due to survey inconsistencies.
Burns Municipal Airport	OR	R1	1942	1987	2	2	comme	0		0	2" AC overlay, fabric, chip seal, 2" AC, 6" base, and 6" subbase.
Burns Municipal Airport	OR	R2	1942	1978	2		base	6	subbase	6	
Chiloquin State Airport	OR	R1	1961	1968	1.25		base	4		0	
Christmas Valley Airport	OR	R1	1985	1985			AC	3	4 base/2 su	0	BST on top of 3" AC
Condon State Airport	OR	R1	1986	1986	5		base	2		0	
Corvallis Municipal Airport	OR	R1	1942	1984	5.5	3	base	6	subbase	9	3" AC overlay applied over 2.5" AC

Chiloquin State Airport	OR	R1	25	1987	0	0	0	0	Seal coat	1968
Christmas Valley Airport	OR	R1	90	1987	86	1991	0	0		
Condon State Airport	OR	R1	94	1987	78	1991	0	0		
Corvallis Municipal Airport	OR	R1	93	1988	0	0	0	0	Overlay	1984
Corvallis Municipal Airport	OR	R2	55	1988	0	0	0	0		
Cottage Grove Airport	OR	R1	83	1988	0	0	0	0		
Cottage Grove Airport	OR	R2	85	1988	0	0	0	0		
County Squire Airpark	OR	R1	70	1988	0	0	0	0		
Creswell Municipal Airport	OR	R1	98	1988	0	0	0	0		
Florence Municipal Airport	OR	R1	95	1988	0	0	0	0	Reconstruc	1985
Gold Beach Municipal Airport	OR	R1	90	1986	88	1989	0	0		
Hermiston Municipal Airport	OR	R1	80	1988	0	0	0	0	Overlay	1977
Hermiston Municipal Airport	OR	R2	87	1988	0	0	0	0		
Hood River Airport	OR	R1	96	1987	92	1991	0	0		

Cottage Grove Airport	OR	R1	1966	1966	1.5		base	7		0	
Cottage Grove Airport	OR	R2	1970	1970	1.5		base	7		0	
County Squire Airpark	OR	R1	1976	1976	2		base	6		0	
Creswell Municipal Airport	OR	R1	1987	1987	2		base	4	subbase	12	
Florence Municipal Airport	OR	R1	1968	1985	2		base	6		0	
Gold Beach Municipal Airport	OR	R1	1964	1964	1		base	6		0	
Hermiston Municipal Airport	OR	R1	1959	1977	3.5	2	base	3.5		0	2" AC overlay applied over 1.5" AC
Hermiston Municipal Airport	OR	R2	1977	1977	3		base	6		0	
Hood River Airport	OR	R1	1986	1986	2		base	9		0	
Hood River Airport	OR	R2	1986	1986	2		base	13		0	
Hood River Airport	OR	R3	1986	1986	2		base	6		0	
Independence State Airport	OR	R1	1974	1974	2		base	2	subbase	6	
Illinois Valley Airport	OR	R1	1953	1977	2	2	BST	0	4 base/6 su	0	2" AC overlay applied over BST
Illinois Valley Airport	OR	R2	1960	1960	3			0		0	
John Day State Airport	OR	R1	1962	1962	2		base	9		0	
John Day State Airport	OR	R3	1982	1982	2		base	4	subbase	9	

Hood River Airport	OR	R2	95	1987	90	1991	0	0		
Hood River Airport	OR	R3	91	1987	91	1991	0	0		
Independence State Airport	OR	R1	91	1986	88	1989	0	0		
Illinois Valley Airport	OR	R1	87	1987	83	1991	0	0	Overlay	1977
Illinois Valley Airport	OR	R2	93	1987	91	1991	0	0		
John Day State Airport	OR	R1	68	1986	71	1989	0	0		
John Day State Airport	OR	R3	93	1986	92	1989	0	0		
Josephine State/County Airport	OR	R1	72	1986	81	1991	0	0		
La Grande Municipal Airport	OR	R1	51	1986	54	1989	0	0		
La Grande Municipal Airport	OR	R2	72	1986	68	1989	0	0	Overlay	1974
La Grande Municipal Airport	OR	R3	88	1986	78	1989	0	0		
Lake County Airport	OR	R1	71	1987	68	1991	0	0	Overlay	1985
Lexington Airport	OR	R1	69	1987	88	1991	0	0		
Lebanon State Airport	OR	R1	88	1988	0	0	0	0	Overlay	

La Grande Municipal Airport	OR	R1	1942	1942	2		base	4	subbase	4.5	Survey results are inconsistent
La Grande Municipal Airport	OR	R2	1942	1974	6	4	base	4	subbase	4.5	4" AC overlay over 2" AC
La Grande Municipal Airport	OR	R3	1974	1984	2		base	6	subbase	4.5	Portion of R1 with different specs
Lake County Airport	OR	R1	1943	1975	3.75	1.75	base	11	subbase	4.5	1.75" AC overlay applied over 2" AC and slurry sealed
Lexington Airport	OR	R1	1965	1965			base	4	subbase	10	Survey results are inconsistent
Lebanon State Airport	OR	R1	0	0	3.5	1.5	base	6		0	1.5" AC overlay applied over 2" AC
Lebanon State Airport	OR	R2	1972	1972	2		base	6.5		0	
Madras City/County Airport	OR	R1	1943	1977	4	2	base	7.5	subbase	9	2" AC overlay applied over 2" AC. Survey results are inconsistent.
Madras City/County Airport	OR	R2	1943	1943	2		base	4	subbase	10	Survey results are inconsistent.
Madras City/County Airport	OR	R3	1943	1943	9.5			0		0	
Madras City/County Airport	OR	R4	1943	1943	3		base	6	subbase	10	
McDermitt State Airport	OR	R1	1965	1965	2		base	3	subbase	7	Climate related problems. Very low activity.
McMinnville Municipal Airport	OR	R1	1943	1943	2		base	6	subbase	8	
McMinnville Municipal Airport	OR	R2	1943	1980	2		base	6	subbase	10	
NewHalam Bay State Airport	OR	R1	1965	1979			base	6		0	TBST applied over old BST surface
North Bend Municipal Airport	OR	R1	1943	1977	5	2	base	6	subbase	4.5	2" AC overlay applied over 3" AC and BST

Madras City/County Airport	OR	R1	84	1986	95	1991	0	0	Overlay	1977
Madras City/County Airport	OR	R2	16	1986	98	1991	0	0		
Madras City/County Airport	OR	R3	46	1986	0	0	0	0		
Madras City/County Airport	OR	R4	39	1986	0	0	0	0		
McDermitt State Airport	OR	R1	96	1986	76	1989	0	0		
McMinnville Municipal Airport	OR	R1	56	1988	0	0	0	0		
McMinnville Municipal Airport	OR	R2	61	1988	0	0	0	0	Slurry seal	1980
NewHalam Bay State Airport	OR	R1	80	1987	77	1991	0	0	TBST	1979
North Bend Municipal Airport	OR	R1	90	1988	0	0	0	0	Overlay	1977
North Bend Municipal Airport	OR	R2	88	1988	0	0	0	0	Overlay	1977
North Bend Municipal Airport	OR	R2A	90	1988	0	0	0	0	Overlay	1977
North Bend Municipal Airport	OR	R3	75	1988	0	0	0	0	Chip seal	1952
Oakridge State Airport	OR	R1	70	1991	0	0	0	0		
Ontario Municipal Airport	OR	R1	84	1986	70	1989	0	0	Reconstruc	1977

North Bend Municipal Airport	OR	R2A	1943	1977	4.25	2	base	6.25	subbase	4	2" AC overlay applied over 2.25" AC and BST
North Bend Municipal Airport	OR	R3	1943	1952			AC	3	5.5 base/4	0	BST applied over 3" AC
Oakridge State Airport	OR	R1	0	0			BST	0	subbase	5	TBST applied over existing BST
Ontario Municipal Airport	OR	R1	1977	1977	2		base	6	subbase	6	
Oregon City Airpark	OR	R1	1972	1972	1			0		0	
Pacific City/State Airport	OR	R1	1950	1950	2		base	4		0	
Pinehurst State Airport	OR	R1	1956	1985	1	1	BST	0		0	1" AC overlay applied over BST
Pendleton Municipal Airport	OR	R1	1942	1974	10	7	base	7	subbase	6	7" AC overlay applied over 3" AC
Pendleton Municipal Airport	OR	R2	1942	1974	9	7	base	8		0	7" AC overlay applied over 3" AC
Pendleton Municipal Airport	OR	R3	1942	1978	5	3	base	8		0	3" AC overlay applied over 2" AC
Pendleton Municipal Airport	OR	R4	1942	1978	7.5	5.5	base	8		0	5.5" AC overlay applied over 2" AC
Pendleton Municipal Airport	OR	R5	1942	1978	12	10	base	5		0	10" AC overlay applied over 2" AC
Pendleton Municipal Airport	OR	R6	1942				AC	2	base	8	BST applied over 2" AC
Prineville Airport	OR	R1	1979	1979	2		base	3	subbase	3.5	
Prineville Airport	OR	R2	1979	1979	2		base	6		0	
Prineville Airport	OR	R3	1979	1979			base	6		0	

Oregon City Airpark	OR	R1	45	1988	0	0	0	0		
Pacific City/State Airport	OR	R1	79	1987	75	1991	0	0		
Pinehurst State Airport	OR	R1	83	1987	76	1991	0	0	Overlay	1985
Pendleton Municipal Airport	OR	R1	98	1988	0	0	0	0	Overlay	1974
Pendleton Municipal Airport	OR	R2	97	1988	0	0	0	0	Overlay	1974
Pendleton Municipal Airport	OR	R3	82	1988	0	0	0	0	Overlay	1978
Pendleton Municipal Airport	OR	R4	66	1988	0	0	0	0	Overlay	1978
Pendleton Municipal Airport	OR	R5	87	1988	0	0	0	0	Overlay	1978
Pendleton Municipal Airport	OR	R6	61	1988	0	0	0	0	Chip seal	
Prineville Airport	OR	R1	87	1986	83	1989	0	0		
Prineville Airport	OR	R2	86	1986	85	1989	0	0		
Prineville Airport	OR	R3	39	1986	31	1989	0	0		
Port of Astoria Airport	OR	R1	87	1987	79	1991	0	0	Overlay	1980
Port of Astoria Airport	OR	R1A	77	1987	68	1991	0	0	Overlay	1980

Port of Astoria Airport	OR	R1A	1944	1980	0.75	0.75	PCC	9	subbase	9	.75" AC overlay applied over 6-9" PCC base
Port of Astoria Airport	OR	R2	1944	1944	2.5		base	13		0	Survey results are inconsistent.
Roberts Field/Redmond Airport	OR	R1	1975	1975	4		base	7	subbase	17	
Roberts Field/Redmond Airport	OR	R2	0	0	3		base	2	subbase	10	
Prospect State Airport	OR	R1	1962	1986			BST	0	base	6	Survey results are inconsistent.
Roseburg Municipal Airport	OR	R1	1951	1986	2		base	6	subbase	6	
Scappoose Industrial Airport	OR	R1	1943	1986	2		base	6	subbase	12	
Seaside State Airport	OR	R1	1964	1964	1.75		base	6		0	
Siletz Bay State Airport	OR	R1	1971	1971	1.5		base	4.5	subbase	5	
Sportsman Airpark, Newberg	OR	R1	1965	1965	2		base	4	subbase	10	
Newport Municipal Airport	OR	R1	1944	1944	5	3	base	6	subbase	9	3" AC overlay applied over 2" AC
Newport Municipal Airport	OR	R2	1944	1984	2		base	6	subbase	9	
Newport Municipal Airport	OR	R3	1944	1944	4		base	6	subbase	5	
Sunriver Airport	OR	R1	1970	1985	2	2	DBST	0	base	14	
Sutherlin Municipal Airport	OR	R1	1971	1971	2		base	12		0	
The Dalles Municipal Airport	OR	R1	1943	1965	2.25		base	6.75		0	

Roberts Field/Redmond Airport	OR	R1	88	1986	0	0	0	0	PFC	1981		
Roberts Field/Redmond Airport	OR	R2	92	1986	0	0	0	0				
Prospect State Airport	OR	R1	54	1987	68	1991	0	0	DBST	1986		
Roseburg Municipal Airport	OR	R1	77	1987	57	1991	0	0	Slurry seal	1986		
Scappoose Industrial Airport	OR	R1	65	1987	64	1991	0	0	Slurry seal	1986		
Seaside State Airport	OR	R1	88	1987	83	1991	0	0				
Siletz Bay State Airport	OR	R1	80	1988	0	0	0	0				
Sportsman Airpark, Newberg	OR	R1	57	1986	0	0	0	0				
Newport Municipal Airport	OR	R1	91	1988	0	0	0	0	Overlay	1984		
Newport Municipal Airport	OR	R2	69	1988	0	0	0	0	Slurry seal	1984		
Newport Municipal Airport	OR	R3	74	1988	0	0	0	0				
Sunriver Airport	OR	R1	92	1986	79	1989	0	0	Seal coat	1973	Overlay	1985
Sutherlin Municipal Airport	OR	R1	90	1987	0	0	0	0				
The Dalles Municipal Airport	OR	R1	70	1988	0	0	0	0	Slurry seal	1965		

The Dalles Municipal Airport	OR	R3	1943	1943	2.25		base	6.75		0	
Tillamook Airport	OR	R1	1943	1983	3.5	1.5	base	6	subbase	10	1.5" AC overlay over 2" AC
Tillamook Airport	OR	R2	1943	1983	2		base	6	subbase	10	BST applied over 2" AC.Survey results are inconsistent.
Tri-city State Airport	OR	R1	1970	0	1.5		base	6			BST applied over 1.5" AC
Wasco State Airport	OR	R1	1987	1987			base	4	subbase	6	
Arco (Butte County) Airport	ID	R1	1979	1990	2		base	4	subbase	4	
Bear Lake County Airport	ID	R1	1942	1942	2		base	6	subbase	10	
Bear Lake County Airport	ID	R2	1984	1984	2		base	2	subbase	4	
Buhl Municipal Airport	ID	R1	1983	1992	2		base	4	subbase	6	Crack and fog sealed in 1992.
Burley Municipal Airport	ID	R1	0	1992	4.5	2	base	12		0	Overlayed w/2" AC in 1980, and 2" AC in 1992
Burley Municipal Airport	ID	R2	0	1992	4.2		base	10		0	
Caldwell Airport	ID	R1	1975	1987	2		base	8	subbase	12	Runway reconstructed in 1987
Caldwell Airport	ID	R2	1975	1987	2		base	8	subbase	12	Runway combined w/R1 in 1987 when reconstructed
Challis Airport	ID	R1	1973	1991	2	2	BST	0	base	6	Overlayed w/2" AC in 1986. Slurry sealed in 1991. Fog sealed in 1977/1986.
Coeur D'alene Air Terminal	ID	R1	0	1973	5	3	base	6		0	3" AC overlay over 2" AC
Coeur D'alene Air Terminal	ID	R2	0	1973	5	3	base	6		0	3" AC overlay over 2" AC

The Dalles Municipal Airport	OR	R2	79	1988	0	0	0	0				
The Dalles Municipal Airport	OR	R3	79	1988	0	0	0	0				
Tillamook Airport	OR	R1	92	1987	89	1991	0	0	Overlay	1983		
Tillamook Airport	OR	R2	77	1987	100	1991	0	0	Chip seal	1983		
Tri-city State Airport	OR	R1	88	1987	77	1991	0	0	Chip seal			
Wasco State Airport	OR	R1	87	1987	0	0	0	0				
Arco (Butte County) Airport	ID	R1	66	1986	84	1993	0	0	Reconstruc	1990		
Bear Lake County Airport	ID	R1	27	1986	2	1993	0	0				
Bear Lake County Airport	ID	R2	96	1986	57	1993	0	0	Fog seal			
Buhl Municipal Airport	ID	R1	69	1986	84	1994	0	0	Slurry seal	1992		
Burley Municipal Airport	ID	R1	67	1986	94	1993	0	0	Overlay	1980	Overlay	1992
Burley Municipal Airport	ID	R2	56	1986	90	1993	0	0	Overlay	1992		
Caldwell Airport	ID	R1	94	1986	88	1994	0	0	Slurry seal	1986	Reconstruc	1987
Caldwell Airport	ID	R2	100	1986	0	0	0	0	Slurry seal	1986	Reconstruc	1987

Coeur D'alene Air Terminal	ID	R4	0	1973	3		base	8		0	
Craigmont Municipal Airport	ID	R1	1975	1975	1		base	5	subbase	10	BST applied over 1" AC, 5" base, and 10" subbase. Crack sealed.
Driggs Municipal Airport	ID	R1	1975	1991	4	2	base	4	subbase	6	Overlayed w/2" AC over 2" AC. Part 2 reconstructed w/4" AC and 4" base.
Gooding Municipal Airport	ID	R1	1978	1989	2		base	8		0	
Grangeville (Idaho Co.) Airport	ID	R1	1965	1988	5		base	12	subbase	12	Crack sealed
Grangeville (Idaho Co.) Airport	ID	R2	1983	1988	4		base	18		0	
Grangeville (Idaho Co.) Airport	ID	R3	1983	1988	4		base	18		0	
Jerome County Airport	ID	R1	0	1975				0		0	BST applied over 7.5" AC, 3.5" base. R1 no longer valid at 1994 survey.
Jerome County Airport	ID	R2	1981	1987	2		base	4	subbase	6	
Kellogg (Shoshone Co.) Airport	ID	R1	0	1980	2	1	base	4	subbase	24	Overlayed with 1" AC over 1" AC in 1980
Kellogg (Shoshone Co.) Airport	ID	R2	0	1980	2	1	base	4	subbase	24	Overlayed with 1" AC over 1" AC in 1980
Kellogg (Shoshone Co.) Airport	ID	R3	0	1983	1.5		base	5		0	
Kellogg (Shoshone Co.) Airport	ID	R4	0	1980	4	3	base	5	subbase	24	Overlayed with 3" AC over 1" AC in 1980
Kellogg (Shoshone Co.) Airport	ID	R5	0	1980	4	3	base	4	subbase	24	Overlayed with 3" AC over 1" AC in 1980
McCall Municipal Airport	ID	R1	1974	1990	6.5	3.5	base	6		0	Overlayed with 3.5" AC over 3" AC in 1990
Mountain Home Municipal Airpor	ID	R1	1973	1993	4	2	base	7.5	subbase	8	Overlayed with 2" AC over 2" AC

Coeur D'alene Air Terminal	ID	R1	77	1986	0	0	0	0	Overlay/Slu	1973		
Coeur D'alene Air Terminal	ID	R2	79	1986	0	0	0	0	Overlay/Slu	1973		
Coeur D'alene Air Terminal	ID	R3	79	1986	0	0	0	0	Overlay/Slu	1973		
Coeur D'alene Air Terminal	ID	R4	89	1986	0	0	0	0	Slurry seal	1973		
Craigmont Municipal Airport	ID	R1	57	1986	56	1995	0	0	Fog seal	1987		
Driggs Municipal Airport	ID	R1	81	1986	98	1993	0	0	Overlay	1991		
Gooding Municipal Airport	ID	R1	86	1986	77	1994	0	0	Slurry seal	1985	Slurry seal	1989
Grangeville (Idaho Co.) Airport	ID	R1	71	1986	78	1995	0	0	Overlay	1983	Slurry seal	1988
Grangeville (Idaho Co.) Airport	ID	R2	73	1986	82	1988	0	0	Slurry seal	1988		
Grangeville (Idaho Co.) Airport	ID	R3	73	1986	79	1995	0	0	Slurry seal	1988		
Jerome County Airport	ID	R1	65	1986	0	0	0	0				
Jerome County Airport	ID	R2	90	1986	82	1994	0	0	Slurry seal	1987	Fog seal	1991
Kellogg (Shoshone Co.) Airport	ID	R1	94	1986	62	1995	0	0	Overlay	1980		
Kellogg (Shoshone Co.) Airport	ID	R2	94	1986	60	1995	0	0	Overlay	1980		

Orofino Municipal Airport	ID	R1	1969	1980	2		base	4	subbase	4	Crack sealed.
Priest River Municipal Airport	ID	R1	1975	1980	2.5		base	6		0	
Rexburg (Madison County) Airp	ID	R1	1972	1991	4		base	6	subbase	6	Runway reconstructed with 4" AC in 1991.
Rexburg (Madison County) Airp	ID	R3	1977	1991	4		base	6	subbase	6	Runway reconstructed with 4" AC in 1991.
Rexburg (Madison County) Airp	ID	R4	1977	1977	2.5		base	8	subbase	12	Runway no longer applicable after reconstruction of R1 and R3 in1991.
St. Maries Municipal Airport	ID	R1	1978	1987	3.5	2	base	11		0	Runway overlayed w/2" AC over 1.5" AC in 1987. 3 New runway sections were built in 1987.
Sandpoint Airport	ID	R1	1952	1988	2		base	10	subbase	3	Runway reconstructed w/2" AC in 1988.
Sandpoint Airport	ID	R2	0	0	2			0		0	No longer valid after R1 reconstruction.
Soda Springs Airport	ID	R1	1969	1992	4.5	2	base	0		0	Overlayed with 2" AC over 2.5" AC.

Kellogg (Shoshone Co.) Airport	ID	R3	40	1986	22	1995	0	0	Slurry seal	1983		
Kellogg (Shoshone Co.) Airport	ID	R4	96	1986	82	1995	0	0	Overlay	1980		
Kellogg (Shoshone Co.) Airport	ID	R5	93	1986	80	1995	0	0	Overlay	1980		
McCall Municipal Airport	ID	R1	87	1986	82	1993	0	0	Slurry seal	1985	Overlay	1990
Mountain Home Municipal Airpor	ID	R1	70	1986	93	1993	0	0	Overlay	1993		
Nampa Municipal Airport	ID	R1	91	1986	48	1994	0	0	Fog seal	1982	Slurry seal	1985
Orofino Municipal Airport	ID	R1	81	1986	59	1995	0	0	Slurry seal	1980		
Priest River Municipal Airport	ID	R1	86	1986	27	1995	0	0	Slurry seal	1980		
Rexburg (Madison County) Airp	ID	R1	63	1986	99	1991	0	0	Reconstruc	1991		
Rexburg (Madison County) Airp	ID	R3	71	1986	99	1991	0	0	Reconstruc	1991		
Rexburg (Madison County) Airp	ID	R4	61	1986	0	0	0	0	Slurry seal			
St. Maries Municipal Airport	ID	R1	59	1986	67	1995	0	0	Overlayed	1987		
Sandpoint Airport	ID	R1	24	1986	83	1995	0	0	Reconstruc	1988		
Sandpoint Airport	ID	R2	45	1986	0	0	0	0				

APPENDIX F

Modeling Equation Summary

Evaluation Category	Sub Category	Regression Category	R^2	T-ratio	SEE	b0	b1	Mean Square	RMSE
Less 3 inches AC & Less 8 inches base	All	**Linear**	**28.2**	**4.06**	**17.630**	**94.0**	**0.9950**	**310.8298**	**17.63**
		Logarithmic	**36.6**	**4.93**	**16.570**	**78.1**	**1.3900**	**274.4663**	**16.57**
		Power	23.2	3.56	0.318	73.8	0.0190	0.1010565	0.32
		Exponential	18.0	3.04	0.328	92.1	0.0140	0.10789372	0.33
		Power = 1.25	**23.1**			**92.0**	**0.3840**	**332.9953**	**18.25**
		Power = 1.5	18.6			90.4	0.1450	352.55767	18.78
		Power = 1.75	14.8			89.0	0.0540	369.04362	19.21
		Power = 2	11.7			88.0	0.0200	382.49788	19.56
		Power = 2.25	9.2			87.1	0.0070	393.22315	19.83
		Power = 2.5	7.2			86.4	0.0030	401.62922	20.04
		Power = 2.75	5.7			85.8	0.0010	408.14181	20.20
		Power = 3	4.6			85.4	0.0003	413.15198	20.33
	WA	**Linear**	**60.7**	**5.13**	**17.470**	**100.4**	**2.3800**	**305.2892**	**17.47**
		Logarithmic	44.3	3.68	20.800	68.4	2.0100	432.6021	20.80
		Power	31.1	2.77	0.421	61.8	0.0310	0.1776097	0.42
		Exponential	43.6	3.62	0.381	101.1	0.0370	0.1453555	0.38
		Power = 1.25	**60.5**			**99.2**	**1.1200**	**306.78992**	**17.52**
		Power = 1.5	59.7			98.0	0.5200	313.40365	17.70
		Power = 1.75	58.3			96.9	0.2400	323.67612	17.99
		Power = 2	56.7			95.7	0.1100	336.57137	18.35
		Power = 2.25	54.8			94.6	0.0500	351.28946	18.74
		Power = 2.5	52.7			93.5	0.0230	367.19658	19.16
		Power = 2.75	50.6			92.5	0.0100	383.79066	19.59
		Power = 3	48.4			91.4	0.0050	400.67841	20.02
	OR	**Linear**	**54.7**	**4.79**	**5.620**	**95.6**	**0.4610**	**31.63643**	**5.62**
		Logarithmic	**80.2**	**8.76**	**3.720**	**87.1**	**0.8030**	**13.8635**	**3.72**
		Power	76.9	7.95	0.045	86.8	0.0090	0.0020185	0.04
		Exponential	55.0	4.82	0.063	95.5	0.0050	0.00392762	0.06
		Power = 1.25	**50.3**			**94.9**	**0.1820**	**34.76425**	**5.90**
		Power = 1.5	47.1			94.3	0.0720	36.96883	6.08
		Power = 1.75	44.8			93.9	0.0290	38.5802	6.21
		Power = 2	43.0			93.5	0.0110	39.82067	6.31
		Power = 2.25	41.6			93.2	0.0050	40.82989	6.39
		Power = 2.5	40.4			93.0	0.0020	41.69195	6.46
		Power = 2.75	39.3			92.8	0.0010	42.4558	6.52
		Power = 3	38.3			92.6	0.0003	43.14909	6.57
Less 3 inches AC & More 8 inches base	All	**Linear**	**73.0**	**10.13**	**7.160**	**97.6**	**1.7000**	**51.2939**	**7.16**
		Logarithmic	46.8	5.78	10.050	83.4	1.1000	100.9217	10.05
		Power	39.2	4.95	0.140	82.1	0.0130	0.0194977	0.14
		Exponential	**69.9**	**9.39**	**0.098**	**98.1**	**0.0220**	**0.00965831**	**0.10**

Evaluation Category	Sub Category	Regression Category	R^2	T-ratio	SEE	b0	b1	Mean Square	RMSE
		Power = 1.25	**68.8**			**96.3**	**0.7880**	**59.119**	**7.69**
		Power = 1.5	64.5			95.2	0.3620	67.32312	8.21
		Power = 1.75	60.3			94.4	0.1660	75.27056	8.68
		Power = 2	56.4			93.7	0.0760	82.75769	9.10
		Power = 2.25	52.7			93.2	0.0340	89.74503	9.47
		Power = 2.5	49.3			92.7	0.0160	96.25078	9.81
		Power = 2.75	46.1			92.3	0.0070	102.30914	10.11
		Power = 3	43.1			92.0	0.0030	107.95507	10.39
	WA	**Linear**	**71.5**	**5.93**	**9.770**	**98.6**	**1.6900**	**95.5153**	**9.77**
		Logarithmic	49.9	3.73	13.000	78.4	1.4100	168.0943	12.97
		Power	42.8	3.24	0.187	76.4	0.0180	0.0348016	0.19
		Exponential	65.9	5.20	0.144	99.0	0.0220	0.02075633	0.14
		Power = 1.25	**68.7**			**97.4**	**0.7750**	**104.99043**	**10.25**
		Power = 1.5	65.5			96.4	0.3550	115.65005	10.75
		Power = 1.75	62.2			95.5	0.1620	126.73317	11.26
		Power = 2	58.9			94.7	0.0740	137.90903	11.74
		Power = 2.25	55.6			94.0	0.0330	149.00813	12.21
		Power = 2.5	52.3			93.4	0.0150	159.92278	12.65
		Power = 2.75	49.1			92.8	0.0070	170.5713	13.06
		Power = 3	46.1			92.2	0.0030	180.88664	13.45
	OR	**Linear**	**72.2**	**7.56**	**4.990**	**98.0**	**2.0200**	**24.8579**	**4.99**
		Logarithmic	57.2	5.43	6.180	87.1	0.8270	38.2479	6.18
		Power	53.5	5.03	0.074	86.7	0.0090	0.00548456	0.07
		Exponential	71.4	7.41	0.058	98.1	0.0230	0.00337391	0.06
		Power = 1.25	**68.0**			**97.1**	**1.0800**	**28.63607**	**5.35**
		Power = 1.5	63.8			96.3	0.5760	32.33912	5.69
		Power = 1.75	60.1			95.7	0.3050	35.72731	5.98
		Power = 2	56.7			95.2	0.1620	38.72935	6.22
		Power = 2.25	53.8			94.8	0.0860	41.34673	6.43
		Power = 2.5	51.2			94.5	0.0450	43.6121	6.60
		Power = 2.75	49.1			94.2	0.0240	45.56923	6.75
		Power = 3	47.2			94.0	0.0130	47.26298	6.87
World War II	All	**Linear**	**64.3**	**7.47**	**16.030**	**100.1**	**0.9660**	**257.084**	**16.03**
		Logarithmic	63.3	7.32	16.250	63.7	2.2600	264.079	16.25
		Power	23.7	3.10	0.630	55.1	0.0370	0.3967093	0.63
		Exponential	25.9	3.29	0.621	102.3	0.0160	0.3850515	0.62
		Power = 1.25	**64.4**			**100.0**	**0.3680**	**256.46184**	**16.01**
		Power = 1.5	64.4			99.9	0.1400	256.34761	16.01
		Power = 1.75	64.3			99.8	0.0530	256.73406	16.02
		Power = 2	64.2			99.6	0.0200	257.61028	16.05

Evaluation Category	Sub Category	Regression Category	R^2	T-ratio	SEE	b0	b1	Mean Square	RMSE
		Power = 2.25	64.0			99.4	0.0080	258.96176	16.09
		Power = 2.5	63.8			99.2	0.0030	260.77067	16.15
		Power = 2.75	63.5			98.9	0.0010	263.01625	16.22
		Power = 3	63.1			98.6	0.0004	265.67519	16.30
	WA	**Linear**	**70.2**	**7.67**	**12.960**	**99.7**	**0.8910**	**168.0221**	**12.96**
		Logarithmic	**70.7**	**7.77**	**12.850**	**66.0**	**2.1100**	**165.128**	**12.85**
		Power	61.3	6.29	0.218	62.8	0.0290	0.0474558	0.22
		Exponential	60.9	6.24	0.219	99.7	0.0120	0.047877	0.22
		Power = 1.25	**69.9**			**99.6**	**0.3390**	**169.8604**	**13.03**
		Power = 1.5	69.4			99.4	0.1290	172.12782	13.12
		Power = 1.75	69.0			99.2	0.0590	174.80887	13.22
		Power = 2	68.4			99.0	0.0180	177.88528	13.34
		Power = 2.25	67.8			98.7	0.0070	181.33637	13.47
		Power = 2.5	67.1			98.4	0.0030	185.13932	13.61
		Power = 2.75	66.4			98.1	0.0010	189.26959	13.76
		Power = 3	65.6			97.7	0.0004	193.70131	13.92
Overlays	All	**Linear**	**71.9**	**14.68**	**6.230**	**98.1**	**1.6200**	**38.8535**	**6.23**
		Logarithmic	57.2	10.60	7.700	83.8	1.0300	59.2302	7.70
		Power	51.7	9.48	0.099	83.1	0.0120	0.00975887	0.10
		Exponential	69.4	13.82	0.079	98.3	0.0190	0.006176	0.08
		Power = 1.25	**69.1**			**97.1**	**0.7930**	**42.75238**	**6.54**
		Power = 1.5	66.0			96.2	0.3850	47.13334	6.87
		Power = 1.75	62.7			95.5	0.1860	51.62241	7.18
		Power = 2	59.5			94.8	0.0900	56.04595	7.49
		Power = 2.25	56.4			94.2	0.0430	60.32781	7.77
		Power = 2.5	53.5			93.7	0.0210	64.43967	8.03
		Power = 2.75	50.6			93.3	0.0100	68.37575	8.27
		Power = 3	47.9			92.9	0.0050	72.13976	8.49
	WA	**Linear**	**48.3**	**6.26**	**8.830**	**97.7**	**1.2500**	**78.043**	**8.83**
		Logarithmic	39.6	5.25	9.550	85.3	0.9500	91.1439	9.55
		Power	35.5	4.81	0.120	84.4	0.0110	0.01448245	0.12
		Exponential	46.5	6.04	0.110	97.9	0.0150	0.01201261	0.11
		Power = 1.25	**46.2**			**96.8**	**0.5970**	**81.11239**	**9.01**
		Power = 1.5	44.3			96.0	0.2850	94.13091	9.70
		Power = 1.75	42.4			95.3	0.1360	86.84651	9.32
		Power = 2	40.7			94.8	0.0650	89.40264	9.46
		Power = 2.25	39.2			94.3	0.0310	91.6976	9.58
		Power = 2.5	37.8			93.9	0.0150	93.79272	9.68
		Power = 2.75	36.6			93.5	0.0070	95.72284	9.78
		Power = 3	35.4			93.1	0.0030	97.52083	9.88

Evaluation Category	Sub Category	Regression Category	R^2	T-ratio	SEE	b0	b1	Mean Square	RMSE
	OR	**Linear**	**77.0**	**9.67**	**5.280**	**97.2**	**1.6800**	**27.8836**	**5.28**
		Logarithmic	72.9	8.69	5.720	83.2	1.0600	32.7401	5.72
		Power	68.2	7.75	0.073	82.7	0.0120	0.00527449	0.07
		Exponential	76.3	9.49	0.063	97.3	0.0190	0.00393462	0.06
		Power = 1.25	**73.4**			**96.3**	**0.8510**	**32.19368**	**5.67**
		Power = 1.5	70.1			95.6	0.4300	36.16444	6.01
		Power = 1.75	67.1			95.0	0.2170	39.75198	6.30
		Power = 2	64.5			94.5	0.1090	42.98321	6.56
		Power = 2.25	62.1			94.1	0.0550	45.90311	6.78
		Power = 2.5	59.9			93.7	0.0280	48.55798	6.97
		Power = 2.75	57.9			93.4	0.0140	50.98972	7.14
		Power = 3	56.0			93.1	0.0070	53.23419	7.30
	ID	**Linear**	**73.8**	**5.31**	**6.990**	**101.7**	**2.3500**	**48.8716**	**6.99**
		Logarithmic	37.4	2.44	10.810	86.0	0.8940	116.74987	10.81
		Power	33.4	2.24	0.138	84.9	0.0100	0.01899172	0.14
		Exponential	72.9	5.19	0.088	102.8	0.0290	0.00772113	0.09
		Power = 1.25	77.5			100.8	1.2700	42.03379	6.48
		Power = 1.5	79.0			99.8	0.6660	39.14521	6.26
		Power = 1.75	**79.1**			**98.8**	**0.3430**	**38.91337**	**6.24**
		Power = 2	78.4			97.9	0.1750	40.3181	6.35
		Power = 2.25	77.1			97.1	0.0890	42.66339	6.53
		Power = 2.5	75.6			96.4	0.0450	45.50886	6.75
		Power = 2.75	73.9			95.9	0.0230	48.58658	6.97
		Power = 3	72.3			95.4	0.0110	51.73676	7.19
BSTs	All	**Linear**	**37.2**	**4.43**	**19.280**	**87.9**	**2.5400**	**371.5842**	**19.28**
		Logarithmic	**55.8**	**6.45**	**16.180**	**66.3**	**2.1200**	**261.807**	**16.18**
		Power	42.7	4.96	0.299	62.2	0.0300	0.0894526	0.30
		Exponential	35.6	4.27	0.317	86.5	0.0400	0.1006071	0.32
		Power = 1.25	**31.7**			**85.5**	**1.1600**	**404.40242**	**20.11**
		Power = 1.5	27.4			83.7	0.5350	429.76442	20.73
		Power = 1.75	24.1			82.4	0.2470	449.40402	21.20
		Power = 2	21.5			81.4	0.1150	464.78085	21.56
		Power = 2.25	19.4			80.6	0.0530	476.99081	21.84
		Power = 2.5	17.8			80.0	0.0250	486.83391	22.06
		Power = 2.75	16.4			79.5	0.0120	494.89231	22.25
		Power = 3	15.3			79.1	0.0060	501.59164	22.40
	WA	**Linear**	**35.6**	**3.64**	**19.370**	**85.5**	**2.2800**	**375.3172**	**19.37**
		Logarithmic	**61.6**	**6.21**	**14.950**	**64.9**	**2.2000**	**223.4812**	**14.95**
		Power	47.3	4.65	0.282	61.2	0.0310	0.0795368	0.28
		Exponential	35.9	3.66	0.311	84.0	0.0370	0.0968845	0.31

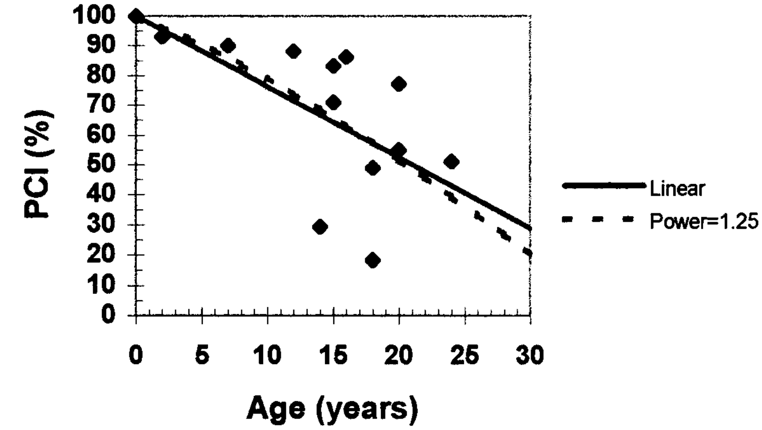
Evaluation Category	Sub Category	Regression Category	R^2	T-ratio	SEE	b0	b1	Mean Square	RMSE
		Power = 1.25	**30.1**			**83.3**	**1.0300**	**407.36924**	**20.18**
		Power = 1.5	26.2			81.7	0.4670	430.20501	20.74
		Power = 1.75	23.3			80.6	0.2150	446.76619	21.14
		Power = 2	21.2			79.8	0.1000	459.07611	21.43
		Power = 2.25	19.6			79.2	0.0470	468.47308	21.64
		Power = 2.5	18.3			78.7	0.0220	475.84466	21.81
		Power = 2.75	17.3			78.3	0.0110	484.78786	22.02
		Power = 3	16.5			78.0	0.0050	486.71047	22.06
	OR	**Linear**	**48.7**	**2.58**	**19.890**	**97.6**	**3.9100**	**395.6286**	**19.89**
		Logarithmic	42.4	2.27	21.070	70.4	1.8800	443.906	21.07
		Power	32.1	1.82	0.382	65.1	0.0270	0.14596085	0.38
		Exponential	39.2	2.12	0.362	97.6	0.0590	0.13080626	0.36
		Power = 1.25	**45.7**			**95.9**	**2.0900**	**418.83874**	**20.47**
		Power = 1.5	42.3			94.3	1.1000	444.84974	21.09
		Power = 1.75	38.8			92.8	0.5780	471.6701	21.72
		Power = 2	35.4			91.4	0.3010	498.10742	22.32
		Power = 2.25	32.1			90.2	0.1560	523.41885	22.88
		Power = 2.5	29.0			89.0	0.0810	547.15705	23.39
		Power = 2.75	26.2			88.0	0.0410	569.08529	23.86
		Power = 3	23.6			87.1	0.0210	589.11742	24.27
Slurry Seals	All	**Linear**	**52.4**	**7.71**	**15.900**	**89.0**	**2.8700**	**252.912**	**15.90**
		Logarithmic	**64.6**	**9.93**	**13.710**	**65.6**	**2.1800**	**188.084**	**13.71**
		Power	49.0	7.20	0.264	62.1	0.0300	0.0695422	0.26
		Exponential	47.5	7.00	0.267	87.7	0.0440	0.0715308	0.27
		Power = 1.25	**45.4**			**86.3**	**1.3100**	**290.194**	**17.04**
		Power = 1.5	39.5			84.3	0.5970	321.67875	17.94
		Power = 1.75	34.6			82.8	0.2700	347.87548	18.65
		Power = 2	30.5			81.6	0.1220	369.59151	19.22
		Power = 2.25	27.1			80.6	0.0550	384.62531	19.61
		Power = 2.5	24.3			79.9	0.0250	402.67281	20.07
		Power = 2.75	21.9			79.2	0.0110	415.30787	20.38
		Power = 3	19.9			78.7	0.0050	425.99083	20.64
	WA	**Linear**	**52.2**	**6.27**	**14.890**	**88.7**	**2.5400**	**221.6534**	**14.89**
		Logarithmic	**69.4**	**9.04**	**11.910**	**66.9**	**2.0900**	**141.73**	**11.91**
		Power	56.9	6.89	0.209	64.3	0.0280	0.0436814	0.21
		Exponential	48.9	5.87	0.228	87.3	0.0360	0.0517714	0.23
		Power = 1.25	**44.5**			**86.1**	**1.1300**	**257.28084**	**16.04**
		Power = 1.5	38.3			84.1	0.5060	286.03025	16.91
		Power = 1.75	33.4			82.6	0.2260	308.83373	17.57
		Power = 2	29.5			81.5	0.1010	326.85337	18.08

Evaluation Category	Sub Category	Regression Category	R^2	T-ratio	SEE	b0	b1	Mean Square	RMSE
		Power = 2.25	26.4			90.7	0.0450	341.13703	18.47
		Power = 2.5	24.0			80.0	0.0200	352.53829	18.78
		Power = 2.75	22.0			79.5	0.0090	361.72236	19.02
		Power = 3	20.4			79.1	0.0040	369.19695	19.21
	ID	**Linear**	**63.9**	**4.21**	**19.050**	**94.0**	**4.1000**	**362.9328**	**19.05**
		Logarithmic	54.2	3.44	21.460	60.8	2.5100	460.3299	21.46
		Power	42.4	2.71	0.433	53.8	0.0400	0.1876423	0.43
		Exponential	57.9	3.71	0.370	93.9	0.0700	0.1372008	0.37
		Power = 1.25	**60.9**			**91.7**	**2.0500**	**393.65136**	**19.84**
		Power = 1.5	57.9			89.9	1.0200	423.55716	20.58
		Power = 1.75	55.1			88.3	0.5060	451.55016	21.25
		Power = 2	52.5			87.0	0.2520	477.40393	21.85
		Power = 2.25	50.2			86.0	0.1250	501.18907	22.39
		Power = 2.5	48.0			85.1	0.0620	523.06756	22.87
		Power = 2.75	46.0			84.3	0.0310	543.21677	23.31
		Power = 3	44.2			83.6	0.0150	561.80253	23.70
Chip Seals	All	**Linear**	**46.4**	**4.37**	**17.540**	**89.8**	**2.5100**	**307.7696**	**17.54**
		Logarithmic	**63.8**	**6.23**	**14.420**	**65.9**	**2.1500**	**207.9436**	**14.42**
		Power	49.0	4.60	0.271	62.3	0.0300	0.073615	0.27
		Exponential	35.4	3.47	0.305	86.8	0.0350	0.0932975	0.31
		Power = 1.25	**39.7**			**87.5**	**1.1500**	**346.44402**	**18.61**
		Power = 1.5	34.1			85.6	0.5240	378.99526	19.47
		Power = 1.75	29.3			84.1	0.2380	406.05136	20.15
		Power = 2	25.5			82.9	0.1080	428.41565	20.70
		Power = 2.25	22.3			81.9	0.0490	446.87057	21.14
		Power = 2.5	19.6			81.0	0.0220	462.11244	21.50
		Power = 2.75	17.4			80.4	0.0100	474.73316	21.79
		Power = 3	15.6			79.8	0.0050	485.22276	22.03
	WA	**Linear**	**39.0**	**2.88**	**18.990**	**90.0**	**2.9600**	**360.5996**	**18.99**
		Logarithmic	**52.4**	**3.78**	**16.780**	**69.0**	**1.9600**	**281.5074**	**16.78**
		Power	37.1	2.77	0.324	64.7	0.0280	0.10479403	0.32
		Exponential	30.4	2.38	0.340	87.9	0.0440	0.11593231	0.34
		Power = 1.25	**32.7**			**87.7**	**1.4100**	**397.90575**	**19.95**
		Power = 1.5	27.4			86.0	0.6640	429.19832	20.72
		Power = 1.75	23.0			84.6	0.3120	455.02885	21.33
		Power = 2	19.4			83.5	0.1460	476.17917	21.82
		Power = 2.25	16.5			82.7	0.0680	493.43745	22.21
		Power = 2.5	14.1			82.0	0.0320	507.5171	22.53
		Power = 2.75	12.2			81.4	0.0150	519.02753	22.78
		Power = 3	10.6			81.0	0.0070	528.4712	22.99

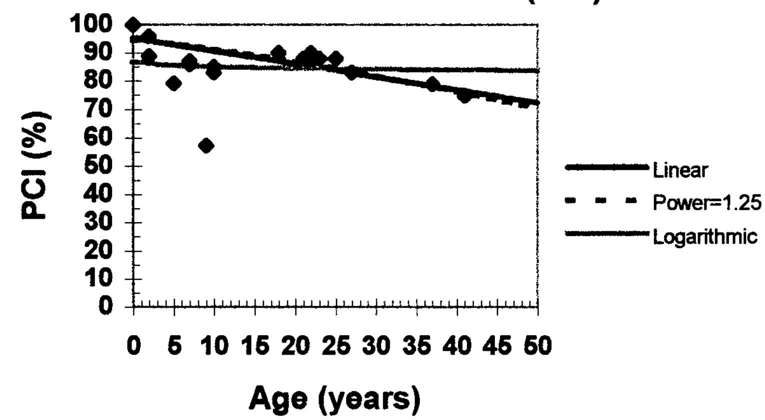
APPENDIX G

Individual State
Regression Plots

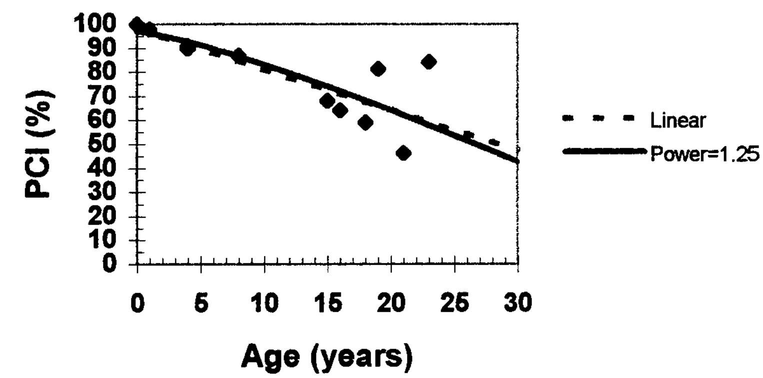
Less than 3 inches AC, Less than 8 inches Base (WA)



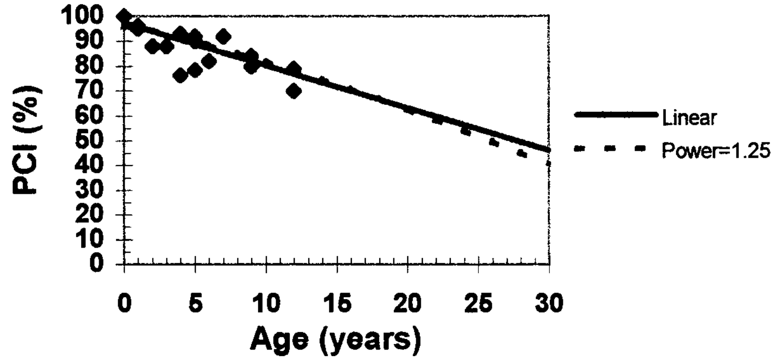
Less than 3 inches AC, Less than 8 inches Base (OR)



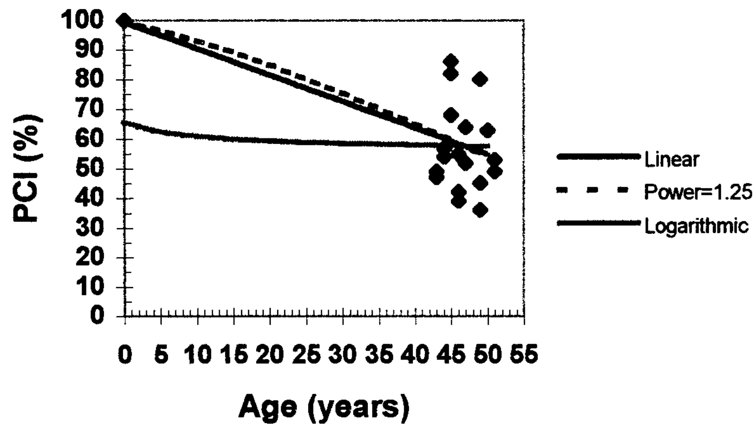
Less than 3 inches AC, More than 8 inches Base (WA)



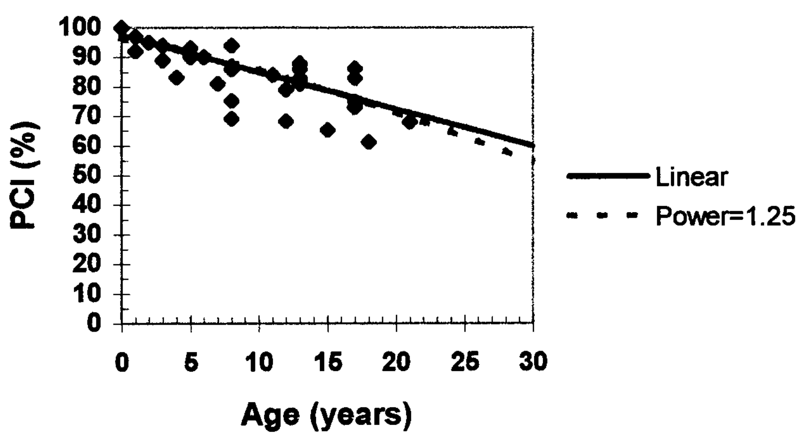
Less than 3 inches AC, More than 8 inches Base (OR)



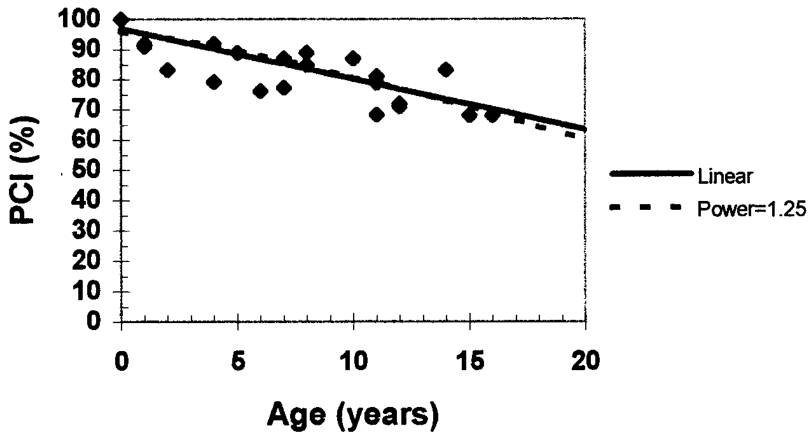
World War Two (WA)



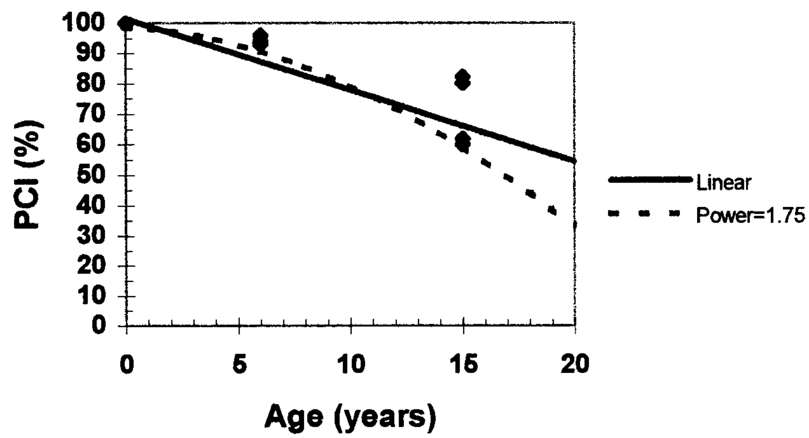
Overlay Pavements (WA)



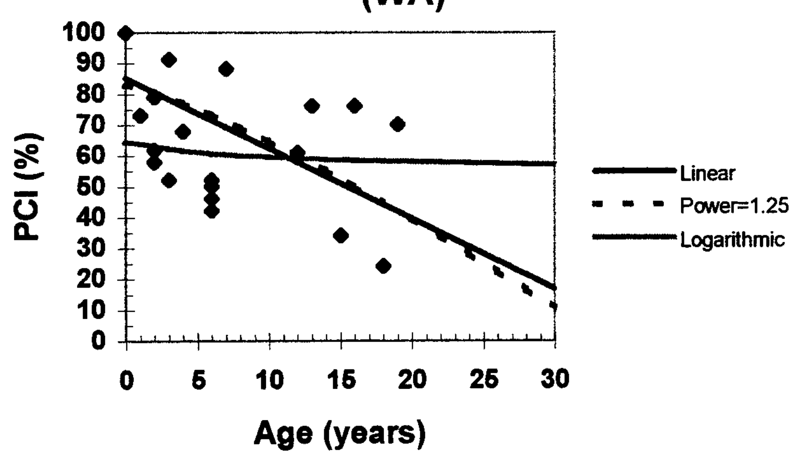
Overlay Pavements (OR)



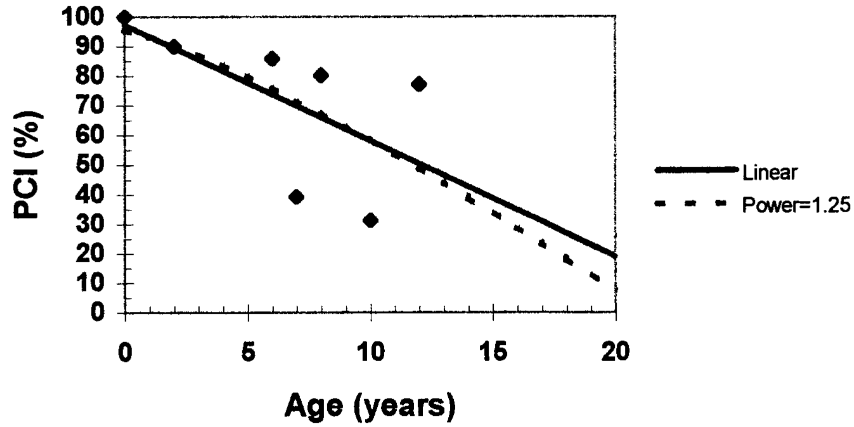
Overlay Pavements (ID)



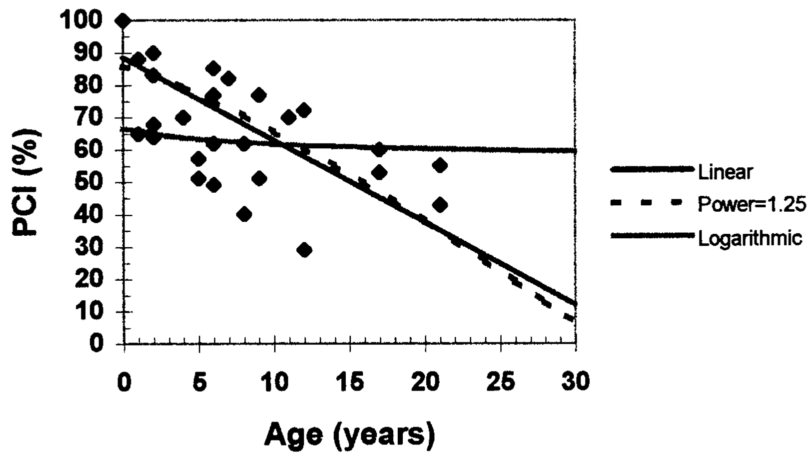
Bituminous Surface Treatments (WA)



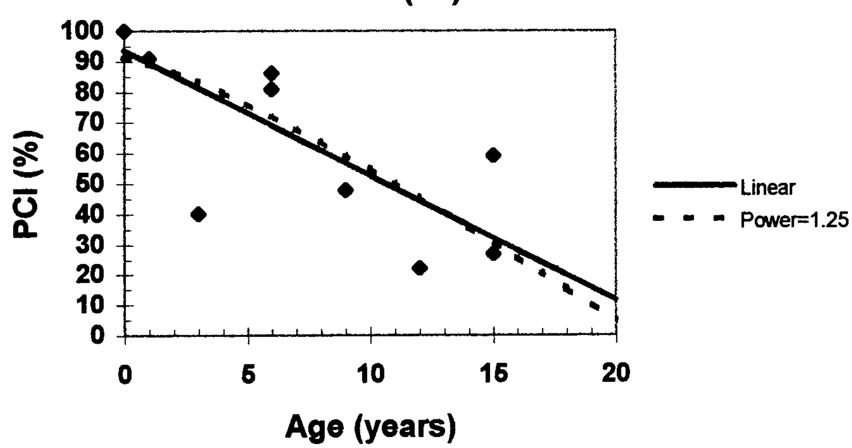
Bituminous Surface Treatments (OR)

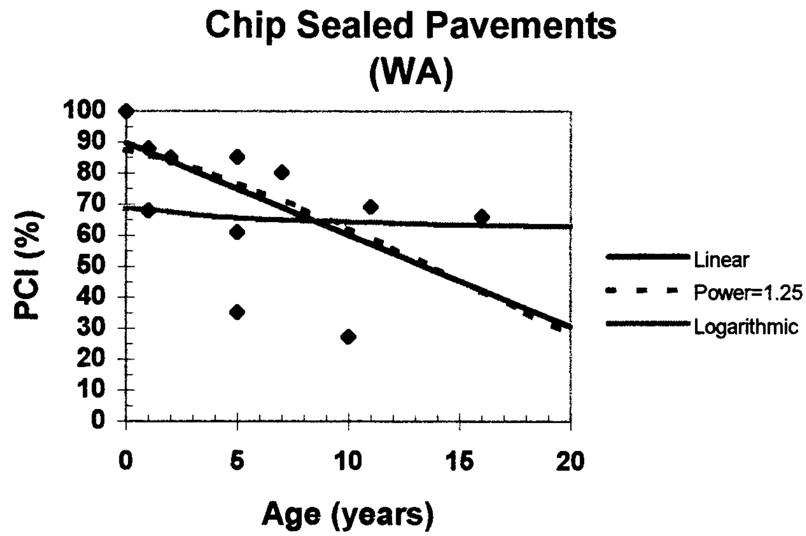


Slurry Sealed Pavments (WA)



Slurry Seald Pavements (ID)





Chip Sealed Pavements
(WA)
100
90
80
70
60
50
40
30
20
10
0
PCI (%)
0
5
10
15
20
Age (years)
Linear
Power=1.25
Logarithmic